ELECTRICAL REVIEW

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The Multiple Switch.

Except the manager and superintendent of the telephone exchanges in the large cities, there are few who realize all the difficulties that have been overcome and that must still be overcome before theoretical and practical perfection in handling the connections called for by their subscribers is attained.

This general ignorance is not to be wondered at when we consider how comparatively novel, even at this day, is the idea of a telephone exchange, an idea not only new in the sense of superseding some other means of communication, but new also in the sense of being an entirely new and distinct means of communication.

The people at large uninformed of all the difficulties of the undertaking, are surprised and disappointed that electricity, after giving them so wonderful an instrument as the telephone, hesitates to make the use of it conveniently universal. It is difficult to persuade them that there is, physiologically speaking, ten times the amount of valuable inventive tissue already expended on telephonic apparatus that there is on the telephone itself. It is a misfortune of the telephone business that the difficulties in the way of prompt and reliable service are not popularly appreciated. The labor of the inventor in this direction is, on this account, more thankless and perhaps less fruitful.

A common error regarding telephonic service is based on the commercial idea of the cheapness of single articles in quantity. It is a natural question to ask, Why do not telephone exchanges reduce instead of raise their rates as the number of their subscribers increases? The difference between retail and wholesale prices would be expected to apply as well to exchange rates as anything else.

But this reasoning loses sight of the fact which makes these rates an exception to the general rule. This fact is the increase of the ratio of connections over the increase of subscribers.

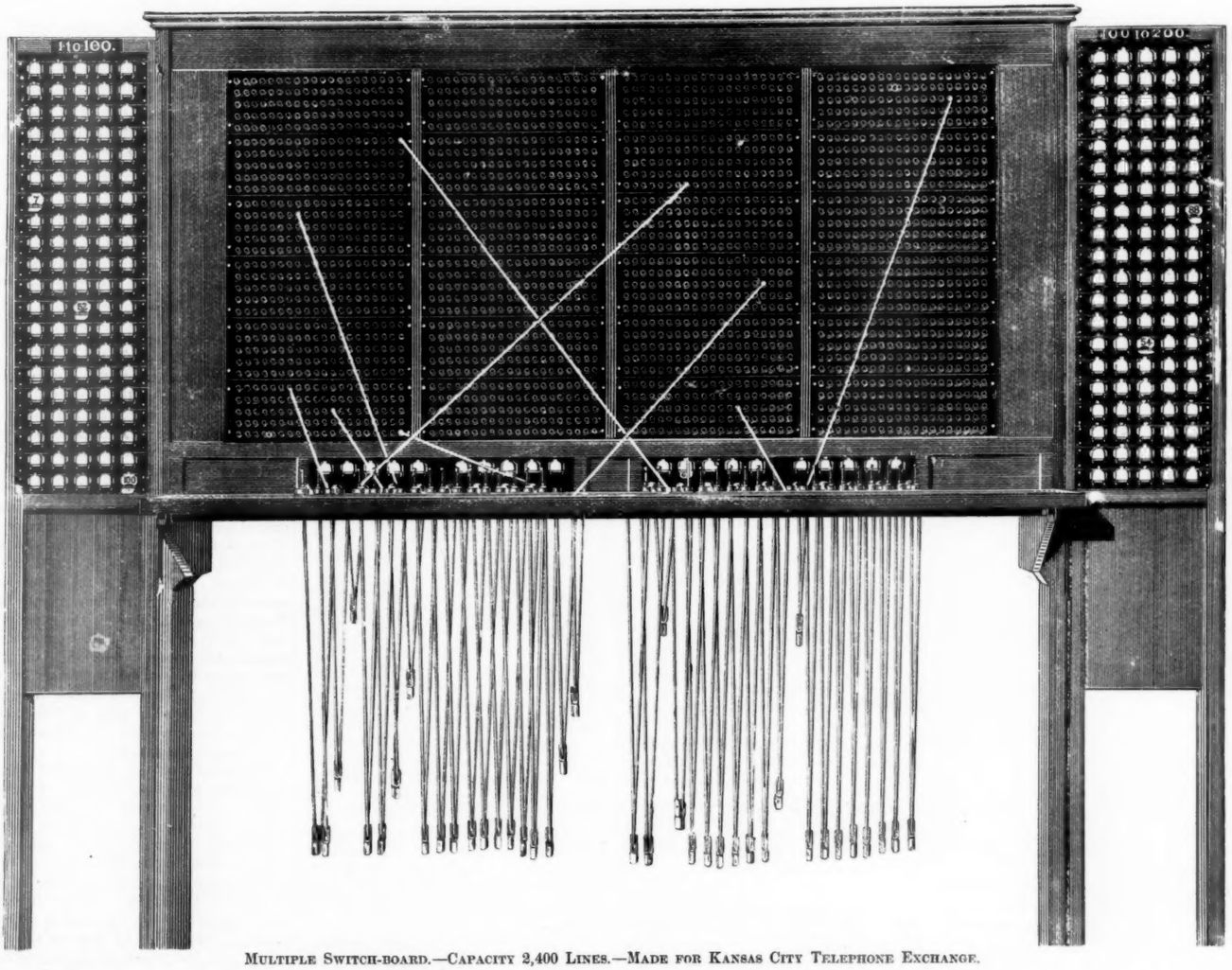
"With two lines terminating in a central office, only two connections can possibly be asked for at any time. With six lines, no less than thirty connections may be asked for; for each of the six may desire to be placed in communication with each of the other five. As the number of lines increases the number of actual calls increases, because with each new subscriber another opportunity for communication is given to all previous subscribers."

When this is fully understood, the difficulty of furnishing facilities to handle the telephone service of an exchange which numbers more than 500 lines will be more readily appreciated.

To give perfect service, the switch-board must enable each operator to perform all the operations required to give subscribers opportunity to converse with each other. That is to say, an operator while answering only one hundred subscribers, should be able to place each of them in connection directly not only with any one of the hundred in his immediate charge, but also with any one of the subscribers of the exchange, should they number even 3,500. Then he must watch to see that they are in actual communication, and disconnect their lines when their conversation is finished.

This, briefly, is what the Multiple Switch-board aims to accomplish, and, in the language of a well-known electrician, who recently visited an exchange where it is worked, it is now "the nearest approach to the ideal switch-board."

The general adoption of this system in all the large cities the world over is looked for at an early date. It is now in use, or soon will be, in the following cities of the United States:



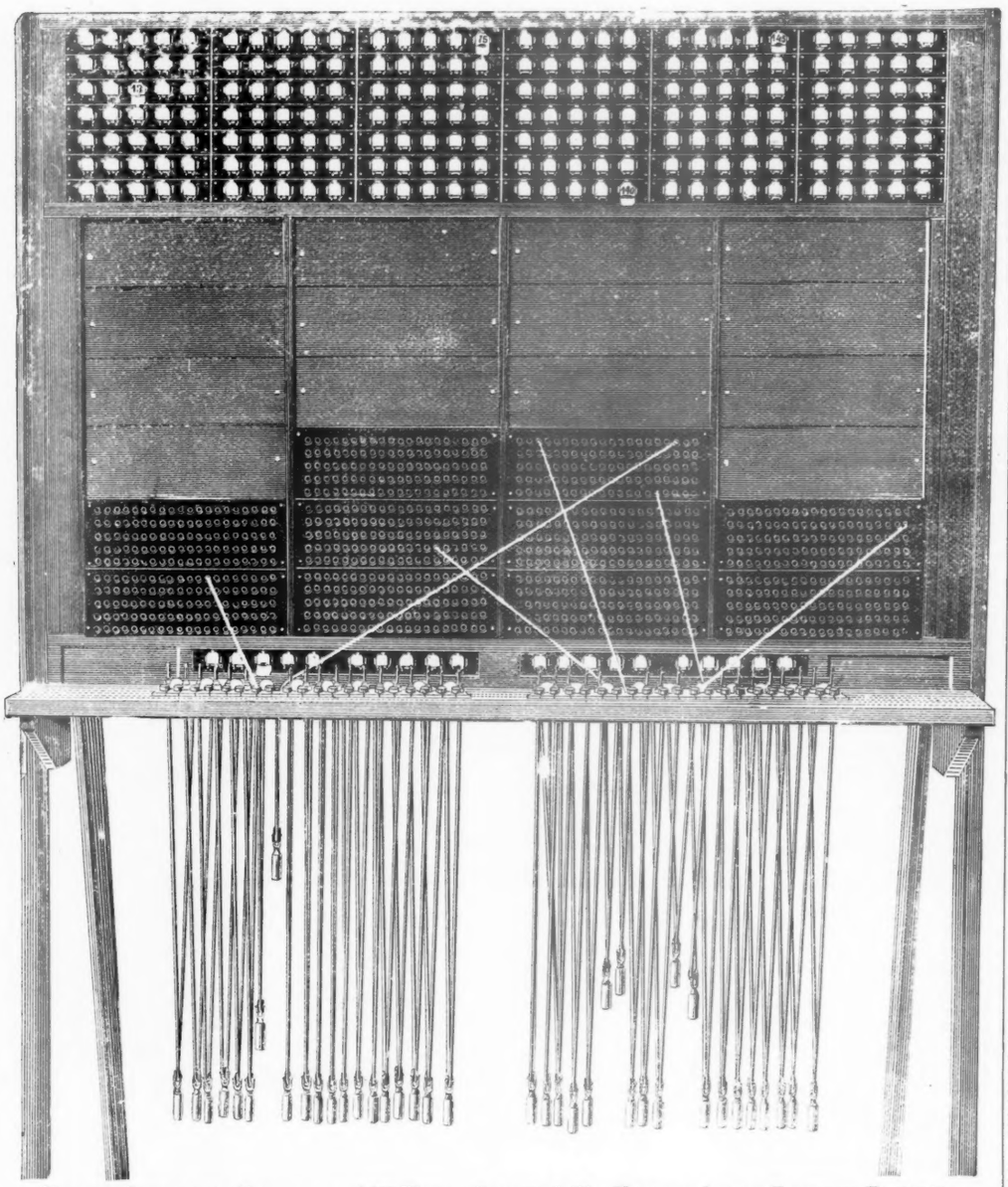
MULTIPLE SWITCH-BOARD.—CAPACITY 2,400 LINES.—MADE FOR KANSAS CITY TELEPHONE EXCHANGE.

Indianapolis, Columbus, O., Toledo, Peoria, Kansas City, Nashville, Memphis, New Orleans, Milwaukee, Minneapolis, and Baltimore.

The apparatus for London and Melbourne has recently been sent forward.

The illustrations above represent the boards made for the Kansas City and London exchanges.

The claim is made for the exchanges using this system that they give the most prompt and reliable service of any, their equal in size, the average time occupied in making connections being ten seconds, and any increase in the number of subscribers does not increase this average.



MULTIPLE SWITCH-BOARD EQUIPPED FOR 1,000 WIRES.—CAPACITY 2,400.—MADE FOR LONDON TELEPHONE EXCHANGE.

The board principles and general details of the multiple system are inventions of the following well-known inventors and electricians: L. B. Firman, C. H. Wilson, C. C. Haskins, C. E. Scribner, M. G. Kellogg, J. I. Sabin, E. T. Githland, and George M. Phelps, Jr. of the Western Electric Co.

The Introduction of the Brush Electric Light in the City of Evansville, Indiana, a Grand Success.

The history of the electric light company in Evansville has been one of continued struggle against opposition and the work of a powerful monopoly. Never has there been an enterprise which has had to bear the brunt of more abuse and hoped for failure. It has been called a fraud, a chimerical scheme, and has been hounded as if it were a most pernicious, swindling enterprise. The company has borne down all opposition, and this morning it arises erect in a victorious climax.

As soon as it was shown that electricity was available as an illuminating power, certain enterprising citizens of Evansville began serious investigations, with a view to introduce in Evansville the light of the future. It was organized as an open company, free to all who wished to invest their money in an enterprise which would not be a monopoly. The company was organized March 9th, 1882, under the name of "The Evansville Brush Electric Light and Power Company." Its first board of directors were: Charles Viele, Mathew Henning, R. K. Dunkerson, Samuel Vickery, F. J. Reitz, J. Eichel and Horace P. Clough. In organizing, Mr M. Henning was made president and Jacob Eichel, secretary and treasurer.

The city a few years previous, in contracting with the Gas Light Company, had, at the *Courier's* suggestion, inserted a very wise provision that the city could recind the contract with the Gas Light Company whenever a cheaper and better light would be provided. This was a wise forethought favorable to the future electric light, and immediately after organizing, the Electric Light Company hastened to avail itself of the clause.

On the 20th of March, 1882, the company proposed to the council to light the city with five towers, each 250 feet high, having eight lights of 4,000 candle power each. The council appointed a special committee, consisting of Messrs. Bennett, Scholz and Wimberg to investigate the proposition and report thereon. In the meantime the April election came on and the question of electric light became the main issue of one of the hottest city campaigns ever held in Evansville. The *Courier* and *Tribune* were advocates of the new light, and did noble service in withstanding the assaults of the gas company and the organ of the monopolists, the Evansville *Journal*. The issue was put fair and square before the people, and they declared that the gas company must go.

The new council, when the question of electric light came up, appointed a new committee, consisting of Messrs. Bray, Wimberg and Scholz, together with Hon. T. C. Bridwell, mayor. The council committee, in company with J. Eichel, representing the Electric Light Company, and Major Booth, superintendent of the Western Union Telegraph Company, as an expert electrician, visited Cleveland, Middletown, Ohio, and Lafayette, to witness the practical workings of the electric light. Upon their return a very favorable report was made, and accordingly a contract was made with the Evansville Brush Light Company for five years. The terms of the contract called for six towers 250 feet high, each having eight lights of 4,000 candles power, and two masts or poles, each 50 feet high, at the wharf. The terms were for $16,500 per annum.

Owing to the failure of the Elgin Tower Company to complete the work contracted for by the Electric Light Company, an extension of time was called for, and ninety days were granted by the city to complete the work, and at the same the company reduced the terms of lighting from $16,500 to $16,000 per annum.

In the latter part of December the time extended was again about to expire, and still the dilatory company of Elgin had failed to deliver and erect the towers. At this time a large number of citizens began to question the practicability of towers at such an enormous height and to doubt their safety. At their request, and it being found that towers of lesser height would answer the purpose as well, the contract with the company was amended and a change made. Instead of six towers 250 feet high, it was provided for twelve towers each 150 feet high, and this change won over many of those who had heretofore opposed the light.

The delays caused by the Elgin Tower Company and the change in the construction and location of the towers again aroused the gas company and its organ to a final struggle. The unfortunate and untimely death of Councilman Robinson, a man of enlarged mind and enterprising spirit, who had been the friend of the electric light, left the council more open to the assaults of the enemy. The opposition in the council acting under the instructions of the Gas Company refused to meet and the council was left without a quorum. The extended time of the company was about to expire and the Gas Company was earnestly working for a new ten years' contract with the city. After a severe fight the Electric Light Company was again victorious and the council adopted the new plan of lighting the city, namely, by towers, each 150 feet high, having four lamps of 200 candle power instead of the 250 foot towers of eight lamps each. By the new arrangement there was secured a greater distribution of the light without any decrease in the aggregate lighting capacity.

While waiting for the towers for city illumination, the works of the company were completed so as to be able to furnish private consumers with the light. For the purpose of illustrating the public illuminating capacity of the electric light, the company with the permission of the council, erected several arches over the intersections of the principal streets, and from each was suspended electric lamps of 2,000 candle power each. It is a fact of the present how successful these were, for they literally cast the gas lights in the shade. The experiment was a great success and the council again changed the contract with the company, substituting for two of the towers on the leading streets, fourteen arches, fifty feet high each, having a lamp of 2,000 candle power, to be erected at the intersection of the leading business streets.

The history of the indomitable Electric Light Company would be far from complete, were we to omit mention of the struggle which the company had against its enemies before the Indiana Legislature last winter. The question having been raised as to the power of the city to grant the right of way to the Electric Light Company, it became necessary to have the city contract with the company legalized. All that the Gas Company and the friends of monopoly could do was brought to bear upon the legislature, and copies of the *Journal*, with its sneers upon the new light, were mailed to the members. Notwithstanding the immense opposition, the plucky company carried its point and, with the renewal of the contract with the city, the backbone of the Gas Company, as a monopoly, was broken for good.

No change has been made in the organization of the company since its inception with the exception of the withdrawal of Horace P. Clough, December 26th, 1882, in whose stead F. A. Preston was chosen. Mr. Hen-

ning, the first president of the company, being unable to devote his whole attention to the interests of the company, on account of frequent absences from the city, resigned his office March 22, and Mr. F. J. Reitz was chosen in his stead.

The capital stock of the company is $100,000, the stock being held by the best business men, and it is not a close corporation. The works have cost $80,000 in cash, and it is claimed are cheap at that, for if they were to be built over again they could not be constructed for a less sum.

The great success of the company is due to the indomitable energy and plucky perseverence of Mr. Jacob Eichel, who has been general manager of the company since its organization, and has devoted one year of his time to his pet scheme. He has borne the brunt of the severe struggle, and the success of the light is almost entirely owing to his push backed by the earnest support and powerful influence of the *Courier*, and the assistance of the *Tribune-News*. Mr. Eichel will remain in the city until the light is turned over to the council. He will then leave for the East to inspect the Swan incandescent light, which is used for house lighting. It is said that the incandescent light is giving the greatest satisfaction. As soon as satisfactory arrangements can be made, Mr. Eichel will arrange to introduce new machinery and contract for house illumination. At present the dynamo capacity of the electric works is about exhausted, and the works are unable to receive any further contracts.

This manner of lighting has had a practical offering to the sight and opinions of our citizens. The company some three months ago inaugurated the system in our thoroughfares in order to show to what perfection the system of electric light has been brought. It demonstrated the fact in that trial that for the dense portion of the city it was better than the tower system. The company, recognizing this fact, so changed their original contract with the city as to substitute arches for towers. The light from these is of that piercing, dazzling brilliancy that give an almost unreal appearance to everything that it strikes, while at the same time it turns night into most perfect day. We think that no citizen, no matter what his prejudices, or how much of an interest he may have in any system of light, can conscienciously say that this portion of the city was not more pefectly lighted than it has been before.

In addition there are two masts on Water street, one situated at the intersection of Water and Division, and the other at the intersection at Locust street. These two masts not only lit up the streets above, between and below there, but their light plainly could be seen upon the Kentucky shore, opposite.

Besides the arches the city has a battery of ten towers, the invention of Mr. John R. Adams, of Elgin, Ills., a town which through this invention has obtained a world-wide reputation. The towers are manufactured exclusively by the Detroit Tower Company of Detroit, Michigan, where the company have most extensive works, capable of turning out six towers a day.

Opinions have been most diverse as to the exact height of towers from which the greatest benefit is obtained. At first it was thought that the higher the lamps could be placed by means of towers, the larger area of territory would be illuminated. But three years of practical experiments have convinced even the warmest advocates of the higher tower system of the fallacy of their theory, and they now unite in the belief that towers of lesser height are best adapted for a more perfect light. Evansville, when the enterprise was first inaugurated, was a warm advocate for the higher tower, and ordered six of two hundred and fifty feet. It was as much for their beauty, in addition to the high light system, that was the cause of their adoption, for they were models of beauty and grace. They were designed to be quadrangular in form, built over street intersections. The lower forty feet of these towers to be composed of firm tapering trussed triangular ligh, to be anchored at each sidewalk corner, leaving the streets free and clear. All the anchorages were made, and one of the towers brought nearly to completion, on the corner of Fourth and Chandler streets. Mr. E. J. O'Beirne, who had charge, did his utmost to push it to an early completion, but the material sent from the Chicago factory was found to be deficient in quality and unfit for use, it not having the required strength and stability which a tower of such height must necessarily have. The Detroit company understanding the importance of durable work, immediately ordered that it be taken down, paying every dollar of expense themselves, and incurring additional loss to the contract with the Electric Light Company here. The experiment proved most advantageous for Evansville in this, that it gave employment to about sixty of her citizens for nearly three months during which time Mr. O'Beirne paid out over $9,000 for work and material. Not only this, it gave the company the advantage of the practical working of the tower of 150 feet system as adopted in other cities.

The towers which give such light to the city as has never been seen within its limits before, and with such brilliant and satisfactory effect, are situated as follows:

Wabash avenue and Franklin street.
Fulton avenue and Pennsylvania street.
Fulton avenue and Columbia street.
Virginia and Edgar streets.
Main and Franklin streets.
William and Governor streets.
Fifth and Division streets.
Eighth and Canal streets.
Oak and Fourth streets.
Jefferson and Putnam streets.

The ten towers now in use are one hundred feet in height, and may be described as skeleton frames, triangular in cross sections, composed of tubing, a section connected by special couplings of malleable iron, and trussed by wrought iron rods diagonally. The tubular section of the posts or standards are eight feet in length. The size of the pipe used for the standards and girts are properly proportioned to resist the estimated strain upon the several points. Each tower is furnished with an elevator, by means of which the attendant can raise and lower himself for the removal of carbons and repairs to the lamps when needed. The bases of the towers are securely anchored to heavy piers of stone work, and they are guaranteed to withstand any and all storms that are not generally destructive to surrounding property. No severer test of their power to withstand storms than was that of last night. In addition the towers are also furnished with patent malleable iron steps clasped upon one of the standards, thus forming a ladder from bottom to top of them. Each tower is surmounted with four lamps, each with 2,000 candle power, giving a total light in strength of 8,000 candle power, and when lighted, displaying to their fullest extent, their graceful and ornamental style of architecture.

Each tower is furnished with four lamps, each lamp having 2,000 candle power.

The united effect of these great sun lamps last night was interesting, novel and impressive to an almost indescribable degree, the districts immediately adjacent to the towers being bathed in splendor far higher in soft intensity than the most brilliant system of street gas jets, while a suburban ride of five-eighths of a mile beyond the outside towers realized a light as clear as full summer moonlight lying abroad on the dark fields and lonely outskirts of the city.

In the immediate vicinity of the towers the light is very brilliant and the shadows formed are very sharply defined. As you go from the light towards a shadow it appears to be dark beyond, but on arriving at the shadow the light is still perfect, though not so strong. The light produced is unquestionably the most perfect imitation of sunlight ever produced by human skill. The difference in the two systems, tower and arch, was plainly visible last night. As the light in its intensity and power, like that of the sun acting upon the unprotected eyes, is painful to a steady gaze, the advantage of the elevated system is at once seen. The arch light is somewhat modified by the use of shades, but the effect is produced at a reduced percentage of light. The result being an excessive illumination in the immediate vicinity of the lamps, and a less perfect illumination a short distance from them. Time would not permit of any extensive trip to the surrounding country to witness the effect of the lights from the towers, but from the hill at Babytown when the reporter first saw it, the appearance was grand beyond any description that he could paint with pencil. It seems almost incredible that the light, which at the point of combustion is not larger than a small marble, can diffuse itself over so much territory. The other points from which the reporter took his views were on the commons lying beyond the poor-house, here the light was the equal, if not stronger than any given by the moon. Hence to the upper part of the city, in the neighborhood of Blackford's grove, where the light had equally as full scope, yet under less advantageous circumstances, as the distance between the towers on Putnum and Canal streets was greater than between any two of the others. Its brilliancy mellowed as space grew between the beholder and the tower, yet at no time was he without the pale of its light. That the system has proved a grand success there is no doubt.

Here the reporter could distinctly observe objects, because of their being so strongly brought out by the light, that would otherwise have escaped his notice.

The station of the Evansville Brush Electric Light and Power Company is situated on Division street just to the right of Main street and between that thoroughfare and the freight depot of the Air Line Road. The building, one of the best appointed in the country, is of fine pressed brick, 127x48 feet, having a fire room of 42x48 feet, an engine room 25x48 feet and the dynamo machine room 53x48 feet. The engines and machinery are first-class in every respect, the best that modern mechanical and electrical engineering could design. The boilers are 18 feet long by 5 feet in diameter, of the horizontal tubular type, and are nominally of one hundred and fifty horse-power each. They are supplied with city water by a direct acting steam pump; there is also a large iron tank kept filled in case any accident should happen to the city's water works, and in case this should be exhausted before the accident could be remedied, there is a large steam pump drawing water from a well driven beneath the fire-room floor. There is in addition to this, a spare steam pump for feeding the boilers. The piping is so arranged that they can be supplied direct from the city mains, from the tank, or from either feed pump. The motive power consists of two automatic "Cummer" engines rated at 125 horse-power, but will work up to 175 each, cylinders 14 inches in diameter, by 30 inches stroke. The band wheels are 14 feet in diameter by 24 inches face, and run at 110 revolutions per minute, steadily and almost noiselessly. By an arrangement of clutch pelleys, either one or both engines, may be run as occasion may require. There are six dynamo electrical machines in operation, and another will soon be added. These machines and all the electrical apparatus are manufactured under the Brush patents by the Brush Electric Company, of Cleveland, Ohio, and include both generator and regulator peculiar to themselves, and may therefore be looked upon as complete in themselves, differing in that respect from all those so-called systems which are represented by either a particular form of machine or a special arrangement of lamp. They manufacture their own carbons, making the whole installation still more peculiar to themselves.

These machines are the same as are used so extensively, not only in this country, but throughout England, the continent of Europe, India, Mexico, South America, China, Japan and in fact nearly all over the world. A general description of the machines would occupy too much space, and would be, perhaps, just a little uninteresting to the *Review's* readers. Two of the machines have a capacity of 20 lights of 4,000 candle power each. One of 5, 4,000 candle power lamps, one of twelve lamps of 2,000 candle power each, one of sixteen lamps of 2,000 candle power each, and one running forty lamps of 2,000 candle power each, making in all a lighting capacity of 216,000 candles power, considerable of a difference in power as displayed by the lighting bugs at the street corners. There are four metallic circuits or loops of heavily insulated wire running from the generating machines in the station to the lamps in different parts of the city. This wire is of pure copper, and weighs altogether over four tons, and is nearly twenty miles in length. From the opinion freely expressed by those opposed to the light before, and while it was being started here, and since, about the danger of running the wires through the streets, one would have supposed that our beautiful city would be depopulated by this time. But what are the facts? On the contrary, after nearly a year's experience with the lights, we have had no fires, no loss of life, or even any one slightly injured. In connection with this, it may be proper to say that the station is supplied with a complete testing apparatus, which enables the electrician to determine at any time during the day or night the condition of all wires outside the station. The machines have a connection with an automatic current governor, which controls them in such a manner that they will generate just enough electricity for the number of lamps in use in the circuit. The lamps are of the regulating order, designed by Mr Brush, and are quite as much an element of the remarkable success of his system of electric lighting as are the machines themselves, and while their performance is surpassed by no other regulator, and although they contain special contrivances to enable them to maintain a steady arc when burning sixteen or more together in a single circuit, they are probably the simplest in construction of all our regulators, involving no clock work or complicated feeding mechanism, or indeed anything that is liable to become deranged. They can be constructed to burn continuously for eight, sixteen, twenty-four, or indeed for any desired number of hours, and the mere hanging of a lamp in its place puts it thereby into the circuit of the other lamps of the series. The lamps are of the double carbon, or sixteen-hour order, and like most of the modern electric lamps the upper carbon descends its own weight until it touches the lower carbon, and the circuit is thereby completed.

The carbon pencils consumed under the Brush system are, before being used, a foot long, and are electro-plated with a thin covering of copper; they last about eight hours, during which time about 9¼ inches of the positive and about 4 inches of the negative carbon are consumed. When, however, the lamps are required to burn for a longer period, double carbon lamps are employed, fitted with two pairs of carbon holders.

The change from the one pair of carbons to the new pair is effected by purely mechanical means, and by a contrivance the ingenuity of which is only measurable by its extreme simplicity.

The lamps are all provided with a simple switch, which enables them to be turned off or on as occasion may require. They are fitted with an automatic cut-out which, in case of accident to any one lamp, cuts out at once from the current the faulty lamp without disturbing the working of the remainder.

The other cities in the country that have adopted the electric light system, and that have it in successful operation are:

Cities.	No. Towers.	Feet.
Aurora	6	150
Fargo	1	150
Denver	6	150
Fairfield	1	150
Topeka	1	175
Bay City	1	220
Rock Island	11	140
Macon	9	150
Tipton, Ia	1	150
Savannah	12	150
Fond du-Lac	6	150
LaCrosse	4	150

Cleveland, O., Wabash, Ind., and Akron, O., have each towers of 250 feet, while St. Paul has one 275 feet.

The Scientific Association.

Our esteemed contemporary, the Minneapolis *Tribune*, says that Minneapolis may well feel honored by the presence last week of so distinguished a body as the "American Association for the Advancement of Science," embracing as it does nearly all of the most eminent men of this continent in the various branches of science. The retiring president is the learned naturalist, Principal Dawson, of Montreal, and the new president, chosen a year ago at the Montreal meeting, is Prof. Young, of Princeton College, an astronomer of wide repute. Within a year or two it has been found convenient to divide the association into nine sections, each of which covers a special department of science. There are vice-presidents representing each section, who preside over the deliberations of their respective departments. This plan enables the association to accomplish a prodigious amount of work, and to hear a very large number of valuable papers during the week of its yearly session.

At the first blush Minneapolis might not seem a very appropriate place for a congress of savants and devotees of pure science, abstruse and unmixed with any stain or taint of the commercial spirit; it might seem that these learned specialists would find here a discordant and displeasing environment. Industrialism, trade, material development, give the key-note of life in a new city of the Northwest. We have not, like Boston and New Haven, a considerable class of amateurish and leisurely people who keep abreast of the latest discoveries, and are familiar with the technicalities and the special literature of science, all from pure love of knowledge. People in this longitude are more gradually interested in the practical applications of science than in its recondite processes and methods. And yet the inharmony is more seeming than real. A Western city illustrates, even if it does not study, modern science. In some sense the rapid and magnificent development of our city is a result of modern science. Certainly, there is a striking analogy between the new and noble growth of the sciences of nature, the creation, as it were, of vast new fields of knowledge, and the birth and growth of a Western city like Minneapolis. Both are essentially modern, and they are kindred manifestations of the new spirit of this century. Each would have been impossible fifty years ago. Science has not only revolutionized modes of thought and ushered in a new era of mental progress, but it has radically affected modes of civilized life. The old has passed away; all things are become new. Modern science knows no ruts, it is bound by no tradition; it looks forward, not backward; absolute freedom characterizes its method, and the truth is its sole object. Seeking only after knowledge and caring naught for gain, modern science has nevertheless created new utilities in a thousand directions. It has given the impulse to more stupendous practical achievements in the past fifty years than the preceding five centuries can show. Under its magic wand have been performed the great miracles of the nineteenth century. Let the metaphysicians hold their summer session in some ancient, moss-grown village like Concord, which breathes of the past and soothes them sweetly into transcendental dreams; they would be rudely disturbed by the aggressive "materialism" of a Western city. But modern science is in glad harmony with modern life; it does not seek classic shades and monastic seclusion, but it sets up its laboratories in the heart of great cities, and is in quick sympathy with progress.

The growth of the natural sciences is undoubtedly the greatest fact of this age. All must admit that this is true as concerns the material and external conditions of life. But it is equally true that natural science has given the stamp to the intellectual life of our time. At the beginning of the century there was no science in our schools or colleges; now science furnishes a large part of the course of study, and furnishes the *method* of study for the rest of the course. The new scientific method, recently applied to the study of medicine, has given better results than had been achieved in medicine for a thousand years. Law has borrowed the comparative and scientific method, and with noble results Theology is beginning timidly to accept the modern in place of the metaphysical and dogmatic mode of investigation. Political economy used to be treated as a branch of metaphysics, and it was indeed a barren and dismal subject. It is very interesting now to note that this American Scientific Association treats the subject as a *science*, and gives "Economic Science and Statistics" a place as one of the nine sections. Economics is no longer a dialectic squabble over definitions; it is an actual study of the facts of production and distribution, a veritable branch of social science and one with a hopeful future.

With all its merits and achievements, science is neither infallible nor omniscient. When it loses its humility and begins to dogmatize and to crack the whip of intolerance over those who do not accept an unverified hypothesis, it has lost its chief virtue, and has become as unfruitful as the deductive modes of thought which it so justly criticises. The moment a scientist becomes fonder of a theory than of some fact which perchance militates against his theory, from that moment he is not a true scientist. After stating that the former generation has had to suffer under the tyranny of spiritualistic metaphysics, Helmholtz had the remarkable candor to add that "the newer generation will probably have to guard against that of the materialistic hypotheses." It would be fortunate if this frank word by the foremost scientist of Germany could be pondered by some of the leaders of scientific thought in England and America, who are disposed to make a tyrannical shibboleth of their pet hypotheses.

A registry of the members attending the association is kept in the office, which shows the following names:

Canada—J. W. Dawson, principal McGill College, Montreal; F. Sterry Hunt, chemist and geologist, Montreal.

Connecticut—Wm G. Mixter, chemist, New Haven.

Illinois—Jessie S. Evans, Streator; Edwin Evans, physician, Streator; G. W. Hough, astronomer, director Dearborn Observatory, Chicago; Leander Stone, editor and botanist, Chicago; Mrs. Leander Stone, Chicago; Milton L. Comstock, professor of mathematics, Knox College, Galesburg; H. S. Carhart, professor of physics, Northwestern University, Evanston; J. Stanley Grimes, editor *Journal of Sciences and Progress*, Chicago; ex-Lieut -Gov. Wm. Bross, president *Tribune* company, Chicago; Miss Alice F. Watch, Rock Island; Wm. McAdams, geologist, Alton; Elisha Gray, electrician, Highland Park; Kitter Hutchison, professor natural sciences, Monmouth; Thomas D. Robertson, banker, Rockford; E. S. Bastin, professor in Chicago College of Pharmacy, Chicago; H. E. Storrs, professor of natural science, Illinois College, Jacksonville.

Indiana—A W. Butler, secretary Brookville Society of National History, Brookville; Mildred S. Cox, New Harmony; E. T. Cox, geologist, New Harmony; J. M. Coulter, professor of biology, Wabash College, Crawfordsville; Lillie J. Martin, teacher of science, high school, Indianopolis.

Iowa—Mrs. Fannie Lupkin, Newton; Albert Lupkin, manufacturer, Newton; Herbert Osborn, teacher in Agricultural College, Ames; M. L. D. Putnam, Davenport; Elizabeth D. Putnam, Davenport; Chas. B. Birge, merchant, Keokuk; Mrs. C. S. Birge, and Misses Fanny and Kate Birge, Keokuk.

Kansas—G. H. Failyer, professor of chemistry, Manhattan; Miss Bertha E. Lovewell, Washburn College, Topeka; Mrs. H. J. Miller, Washburn College, Topeka; J. T. Lovewell, Washburn College, Topeka.

Kentucky—A. B. Nelson, professor of mathematics, Centre College, Danville; John Arm, law, Paducah; Mrs. John Orm, Paducah; Harlow W. Eaton, professor of physics and chemistry, Louisville.

Louisiana—T. G. Richardson, physician, New Orleans; J. S. Copes, physician, New Orleans.

Maryland—Henry A. Rowland, professor of physics, Johns Hopkins University, Baltimore; Henry R. Goodnow, teacher of physics, Johns Hopkins University, Baltimore; Edgar G. Milton, Baltimore.

Massachusetts—Edward S. Morse, director Peabody Academy of Science, Salem, Mass.; H. E. Dollear, teacher, College Hill; Nathaniel Paine, banker, Worcester; J. M. Flint, surgeon U. S. Navy, Boston; W. G. Farlow, botanist, Cambridge; Wm. A. Rogers, astronomer, Cambridge; Elizur Wright, consulting actuary, life insurance, Boston; Cyrus M Warren, chemist, Brookline; John K. Kimball, Boston.

Michigan—Mrs. H. Trowbridge, journalist, Detroit; L. H. Trowbridge, journalist, Detroit; Louis G Carpenter, assistant in mathematics, Agricultural College, Lansing; John W. Lingley, professor of chemistry, Ann Arbor.

Minnesota—Abby G. Mendenhall, R. J. Mendenhall, Minneapolis; Warren Upham, assistant State geologist, Minneapolis; C. H. Du Bois, editor *Saturday Evening Spectator*, Minneapolis; E. Lyman Hood, teacher, Minneapolis; Mrs. D. V. Dean, Minneapolis; Mrs. J. R. Eaton, Minneapolis; A. F. Elliot, physician and lawyer; C. L. Herrick, teacher, Minneapolis; Mrs. C. A. Comstock, Minneapolis; Prof. Wm. J. Warren, teacher, Minneapolis; Mrs. M. J. Eastman, Minneapolis; Mrs. J. M. Flint, Minneapolis; Mrs. R. S. Rogers, Minneapolis; Arthur K. Rogers, Minneapolis; Mrs. S. W. Baker, Minneapolis; Thos. S. Roberts, student, Minneapolis; Mrs. Mary L. Ames, St. Paul; O. A. Robertson, retired, St. Paul; Herbert W. Smith, produce and commission, St. Paul; W. W. Payne, professor of mathematics and chemistry, Carleton College, Northfield; C. W. Hall, professor of geology, mineralogy and botany, University of Minnesota, Minneapolis; E. S. Scribner, manufacturer, St. Paul.

Missouri—Augusta Murtfeldt, teacher, Kirkwood; Mary E. Murtfeldt, entomologist, Kirkwood; Francis E. Nipher, professor of physics, Washington University; Phœbe W. Couzins, legal profession, St. Louis; J. R. Eaton, professor of natural science in William Jewell College, Liberty; H. C. Buck, electrician, West Somerville; D. N. Bean, physician and surgeon, City Hospital, St. Louis; Samuel Manden, builder and superintendent, St. Louis; Joseph Ficklin, professor of mathematics and astronomy, University of Missouri, Columbia; Benjamin F. Thomas, professor of physics, University of the State of Missouri, Columbia; Mrs. Fidelia O Case and Mrs. M. A. Benson, Kansas City; C. M. Woodward, teacher, Washington University; and Mrs. C. M. Woodward, St. Louis.

New York—William W. Spare, assistant in physics, Columbia College, New York City; Alexis A. Julien, geologist, School of Mines, New York City; James Hall, geologist, Albany; Mrs. C. B. Gardner, Rochester; C. B. Gardner, clergyman, Rochester; Mrs. F. D. Mott, Brooklyn. William A. Anthony, professor of physics, Cornell University, Ithaca; Mrs. Esther Herman, New York City; Leroy C. Cooley, professor physics and chemistry, Vassar College, Poughkeepsie; John S. Hicks, lumber merchant, Roslyn, L. I.; Dr. Julius Pohlman, director of museum, Buffalo; William R. Dudley, professor of botany, Ithaca; George F. Kuntz, mineralogist, New York.

New Jersey—C. A. Young, professor of astronomy at Princeton; Mary A. Baldwin, teacher, Summer avenue, Newark; May C. Canniff, Summer avenue, Newark; Malcolm McNeill, instructor in astronomy, Princeton; Mrs. E. Smith, Jersey City.

Ohio—Wm. H. Vieth, Cincinnati; C. Leo Mees, professor chemistry, Columbus; E. W. Hyde, professor of mathematics, Cincinnati; Mrs. T. F. Moses, Urbana; Thos. F. Moses, Urbana; Jos. F. James, custodian, Cincinnati Society Natural History, Cincinnati; Dr. A. E. Heighway, Cincinnati; J. D. Cox, dean Cincinnati Law School, Cincinnati; Edward W. Morley, professor chemistry, Cleveland; Dr. Alfred Springer, chemist, Cincinnati; H. T. Eddy, professor mathematics and astronomy, Cincinnati; Chas. J. Smith, professor of mathematics, Adelbert College, Cleveland; Lemuel Weaver, Urbana; J. C. Mendenhall, Ohio State University, Columbus; G. Frederick Wright, clergyman, Oberlin; Anna Brown, Cincinnati; Miss Jessie Raymond, Cleveland.

Pennsylvania—Mrs. Strote, Mrs. Lilly, Gen. Wm. Lilly, coal and iron, Mauch Chunk; Rev. Selden J. Coppin, Hollenback, professor of mathematics and astronomy, Easton; W. H. Walmesby, optician, Philadelphia; Edward Pennock, manager microscope department, J. W. Queen & Co., Philadelphia; Thos. R. Baker, teacher State Normal School, Millersville; Edwd. D. Cope, naturalist; Philadelphia; E W. Claypole, second general survey, New Bloomfield; J. P. Lesley, state geologist, Philadelphia.

Rhode Island—Theodore F. Jewell, lieut.-commander United States navy, torpedo station, Newport.

Tennessee—Miss Margaret Bowles, teacher the institute, Columbia.

Texas—H. A. Dinwiddie, professor of chemistry, A. and M. College, College Station.

Washington, D. C.—Dr. E. P. Howland, dentist, Robert W. Smiley, Chas. W. Smiley, United States, fish commission; J. R. Eastman, professor mathematics, United States navy; Otis T. Mason, professor, Columbian University; Robert P. Bigelow; W. T. Sampson, commander United States navy, naval observatory; W. H. Holmes, geologist; Maj. J. W. Powell, director of the United States survey.

Wisconsin—Herbert B. Perkins, professor of mathematics, Lawrence University, Appleton; E. S. Holden, astronomer, Washington Observatory, Madison; J. C. Foye, professor chemistry and physics, Lawrence University, Appleton; Geo. F. Kuntz, Chas. H. Chandler, professors in Ripon College, Ripon.

Vermont—Rev. E. H. Canfield, S. S. Arlington, G. H. Perkins, professors natural history, University of Vermont, Burlington.

Electric Gun.

Colonel Fosbery created a sensation at a lecture he gave to an assembly of officers, small-arm inventors and other experts at the Royal United Service Institution by suddenly drawing from its place of hiding, under the table, a wonderful new gun, which he had just brought from Liege. He called it a "baby electric gun" It looked like a pretty carbine, but it had no mechanism, and could not possibly go off until connected up to the source of electric force. This done, it could be fired with amazing rapidity, 104 rounds having a few days before been fired from it by its inventor, M. Pieper of Liege, in two minutes. Colonel Fosbery fired two rounds with infinitessimal powder charges. He had prepared himself by secreting under his vest a small circuit of wire and putting on a banderole, supporting what looked like a two-ounce vial, but was in fact an electric accumulator, with sufficient stored up energy to discharge 2,000 rounds. The cartridges were very innocent looking mites, and contained no detonating substances, nothing in fact but simple powder and a wad. The opinion was expressed by various speakers that the electric gun must once more revolutionize the manufacture of small arms within a brief period.

Enlargement of Electric Light Works.

The Brush Electric Company of Baltimore yesterday began the demolition of the old building formerly used as a galvanized iron works, adjoining their property No. 40 East Monument street, preparatory to building an extension. They will erect a large structure for the accommodation of additional machinery of five hundred horse power. This power will be transmissible by a pair of Buckeye engines, furnished by a Baltimore engineering firm. The shafting pulley and all the machinery except the electrical apparatus will be built by the Brush Electric Company of Cleveland. The dynamos, regulators, and lamps will also be furnished by the above company. The new building will be two

stories in height. The old plant is now, and has been for the past twelve months, running four hundred lights full capacity. The new plant will run five hundred additional lights, making in all nine hundred.

Electric Illumination of Lighthouses.

General Babcock, president of the Light-house Board, has had several conferences with the Brush Electric Company of Baltimore, with a view to using the electric light at Lazaretto, Hawkins' Point, Seven Foot Knoll, Fort Carroll, Bear Creek, and North Point lighthouses. Nearly all the lighthouses on the coasts of England and France are lighted with electricity. A prominent scientist of Europe has said that the condensed beams from the most powerful fixed and flashing first-order seacoast lights of England (with the Douglas four-wick burning oil), are equal to nine thousand and eleven thousand candles, while the condensed beams of the flashing electric light at Souter's Point, three miles below the mouth of the river Tyne, England, is equal in power to eight hundred thousand candles. Some scientists say that the absence in the electric light of the yellow rays which predominate in gas, oil, and other illuminants is disadvantageous. It is admitted, however, by these same scientists that the great power of the electric light over all others more than compensates for any deficiency in the refractory or penetrating power. Each lighthouse would require one generator and a small engine, and the cost would be comparatively small. The Light-house Board will give its decision in the matter in a few days.

More Light.

NEW ORLEANS BUILDINGS AND PRINCIPAL STREETS TO BE BRILLIANTLY ILLUMINATED WITH THE BRUSH ELECTRIC LIGHT.

A visit to the office of the Brush Electric Light Company recently developed the fact that although the number of electric lights in use during the summer months has been smaller than in winter, the causes for which are readily understood, still the company is ready, not only to resume the lighting of these lamps, but is making active preparations for constructing a large number of additional lights this winter.

The courteous gentleman whom the reporter met informed him that last season the company operated four hundred and fifty lights, and it has already orders for one hundred and fifty additional for this winter. All the motive power necessary for this increased number of lights is already here, but more generators will have to be procured.

An important undertaking by the company will be the

LIGHTING OF CHARTRES STREET,

from Canal to Jackson Square, a lamp placed at each corner being calculated upon as sufficient to properly illuminate this time-honored thoroughfare. Everything will be in readiness for the lighting of Chartres street by October 1. At that date also the lights on Royal street will be turned on.

In regard to the lighting of Canal street, the posts and apparatus extending nearly to Claiborne street, are all there, and the light can be put in at very short notice. By subscription among the merchants and with the aid of the City Council, the company anticipates lighting Canal street with the Brush electric light by January 1 of next year. The beautiful appearance of New Orleans' grand boulevard last year when thus illuminated has been the means of inducing many merchants to assist in having the lamps replaced.

The company also proposes to begin in a short time the erection of posts on St. Charles street, similar to those on Canal street.

BEGINNING AT TIVOLI CIRCLE,

the lamps will be extended over as much territory as the residents subscribe for. In this, too, the assistance of the City Council will be necessary, and it is probable that the Council will be asked to encourage the movement. The company contends that in this manner, if they receive the proper encouragement from the city government, they will be enabled to light the whole city with the electric light.

One of the most important improvements to be made is the establishment of a new circuit for merchant service, by which a merchant can obtain at a reduced figure light until nine o'clock at night, which hour is as late as many of them care to have it. Orders for this schedule of light are coming in rapidly. The sporting houses, such as barrooms and gambling places, are all lighted with electric light on the "all night" circuit. The twelve o'clock circuit continues flourishing.

The company, the reporter was informed, is thoroughly satisfied with its present and prospective business, the electric light becoming daily, or rather nightly, more popular. Mr. Bidwell, for instance, will use this year seven or eight more lights for his theaters, and other amusement places contemplate doing likewise In the near future the company will begin introducing the incandescent light, with stored electricity.

This bright outlook will make the darkness and gloom of night of New Orleans things of the past, which will only be found in small towns in the interior of the country.

Electric Light and Blondes.

Nobody appears to have noticed one effect of the electric light—it is going to make brunettes fashionable again. The white glare is, in a color sense, death to the blonde. The pinkest of them take on little shadows under the eyes, and purple tints come into their lips, and their cheeks get ashen. I am speaking now of a natural blonde. The effect upon the artificial bleacher is simply cadaverous. But the brunette sparkles under it like the evening star. What a dreadful state of existence the dear enameled will lead when they can neither go out at day or night! I suppose you know that the hot sun heats the face of the enameled women, gets so hot as to blister the flesh underneath, which would split the artificial covering. If, then, the electric light shuts them in at night also, they might as well be enameled all through in the old Egyptian style, and put into a sarcophagus.

Electricity, What Is It?

Mr. Theopilus Varley in a letter to the London *Electrician* makes the following interesting statements:

This is the first time I have rushed into print, and I am only induced to do so by the dreadfully confused state of the electrical units and my desire to simplify them.

This proves to my mind that the originators of the British association units, and others, did not base them on the true hypothesis; had they done so we should have had but three electrical units instead of the numerous ones now used.

As my opinion is based upon a long experience in rendering electricity an useful assistance to commerce, it will be worth considering, if only calling the attention of the students to the cause of the confusion.

Some 35 years since, when I became acquainted with the science, electricity was generally supposed to be two fluids; then the one-fluid theory became more general'y believed in. This not answering all the requirements of the science, I adopted the theory that electricity was a mode of motion and not self-existent.

This is not quite the correct theory, or is, at all events, a very indistinct mode of stating it.

I am now firmly of opinion that electricity does not exist. I mean in the same sense as motion, which also does not exist—viz.: there is neither motion nor electricity where there is no matter.

Thus, when we talk of motion, we really mean matter moved, and matter cannot be moved without force is applied to it. I therefore think we may safely say that motion is matter combined with force.

Electricity in like manner is matter combined with force, as I afterwards hope to prove.

There is considerable apparent difference between motion and electricity, the difference being, in the case of motion, the whole mass is displaced by the force applied; in the case of electricity (in a closed metallic circuit), it has the outward appearance of force, being conveyed through the conductor without disturbing its particles or altering its structure, its presence being only known by its attendant magnetic radiation; but when we pass electricity through an interval, as in the electric arc, or through a conducting solution, then only does the disturbance of the particles become visible.

It is evident, then (if what I affirm be correct), that the study of electricity becomes the study of a property of matter.

According to my theory, nature has only two properties, namely, matter and force. I request the reader to accept this latter as the basis of my argument.

I will now try to prove what electricity is, and what electric units should be. The names I shall use are those of the B A units, viz., the weber, volt, farad, ohm and second and compare them with the mechanical units they so much resemble.

But first let me state that—

Positive electricity is a condition of matter trying to disintegrate or dissolve.

Negative electricity is that state of matter trying to accumulate.

Our mechanical units are the pound, the foot, and the second.

The pound is the unit of mass only, and has no force of itself.

The foot (or more properly the earth attracting through a foot) also has no force alone, but the unit of force which actuates the unit of mass gives a compound unit of force—the foot pound.

The second is the unit of time during which the force is exerted, and enables us to calculate the total force exerted during any given period.

You will perceive, then, that three units only are required for mechanical force measurements, and as electricity so nearly resembles motion, the same number only are required for electrical force measures, and are:

1. The mass of matter combined with electrical force, which is the weber. This stands in the same relation to the electrical as the pound does to mechanical force.

2. The amount of force actuating the mass, which is the volt, and takes the place of the foot in mechanical force.

3. The second is exactly the same in regard to both electrical and mechanical forces.

Before the reader is capable of comprehending my ideas respecting electrical units, he will require some considerable explanation, more particularly to understand the weber, to do which I must again compare it with motion. A pound thrown across a space does not become heavier or lighter whether sent with a small or great force. Neither is the weber affected whether sent across a space with great or small volt force. I must now inform the reader what the weber is in terms of mechanical force. It is $\frac{1}{10}$ gramme of zinc, but different in other substances according to their atomic weight, and is that quantity of metal which is dissolved from the + plate and deposited on the — plate, by an electric current of one volt through one ohm in one second. This quantity always remains constant, no matter if the weber current be of one or any number of volts, strain, or pressure, or during any time. Therefore I may aver that that amount may be taken as the quantity of matter with which the force is combined.

In like manner as the pound thrown across the space is no measure of the force it carries, so with a weber current, it is no measure of the force it conveys, it being simply the amount of matter with which the force is combined, but the compound unit of mass × force.

Weber × volt = force or work done, and bears the same relation to electrical force as the foot-pound does to mechanical.

I am afraid I have not made myself so distinctly understood as I should like, but it is impossible in a short letter to give the experience of years.

To show the fallacy of many units used, I append the following:

A weber is the electrical unit of mass $\frac{1}{1000}$ of a gramme of zinc, and is that electrical current which deposits that amount of zinc, whether during long or short period, or, in other words, the amount of matter with which force is combined.

A weber current is that current which deposits $\frac{1}{1000}$ of a gramme of zinc per second, and I think that a weber second would be a more suitable term.

A volt is the unit of electrical strain or pressure.

A volt weber is a compound electrical unit of force conveyed, and occupies the same position to electric as the foot-pound does to mechanical force.

These three units—weber, volt and second, with the compound unit volt weber—are all the units required for electrical force measurements.

The ohm is an useful mechanical unit for electric construction, and has a resistance of one to one volt, $\frac{1}{2}$ to two volts, $\frac{1}{10}$ to 10 volts, and so forth.

The following units appear to me not only not necessary, but confusing, viz., a farad means the same quantity as a weber, but has reference to an inductive surface that will hold a weber, with one volt strain, and bears the same relation to a weber as a quart measure does to a quart. A better name for a farad condenser would be a weber condenser.

Coulomb, watt, etc., are only other names for a volt weber.

The ampere is only another name for a weber.

In my opinion, these and numerous other names in the electrical nomenclature should be discontinued.

Locomotive Electric Head-Lights.

A new and brilliant electric head-light for locomotives is being quietly perfected by a modest inventor of Indianapolis, who does not care to have his name made known until a public exhibition has placed it beyond the possibility of failure. The light will equal the light of 4,000 candles.

At present a 20-candle light is the best that can be produced. It will light the track for a mile brilliantly, and the light will be full and continuous. The generator or dynamo will be run by steam at the will of the engineer. It will be located opposite the air-brake and will not take up as much room. By the same machine depots, bridges, crossings and tunnels will be lighted. Extending along the track for a half mile in both directions will be an electric wire connected with the lamps in tunnels and bridges; then extending downward from the dynamo on the engine, the brush will be arranged to touch the wire as soon as it is reached. This will light up the object ahead, and as soon as the brush leaves the wire on the other side the light goes out. A public exhibition will be given soon.

The American Electric and Illuminating Company.

This company have taken a lease of the large store and basement at 234 Devonshire street, Boston, Mass., which it will occupy September 1 as an office and wareroom. The company's business has increased to such an extent that it finds the need of enlarged quarters for the transaction of its office business very pressing, and it has long felt the want of a suitable storeroom in which to keep on hand a supply of dynamos, lamps, wire, insulators, carbons and other supplies constantly needed by the numerous lighting plants which it has established, as well as by others in process of construction at the present time. The quarters which have been secured are admirably adapted for the purpose, having ample vaults and excellent elevator facilities, while the location is central and on the main thoroughfare of communication between the northern and southern depots. The fitting up of these new quarters will begin at once.

Telephonic.

Van Rysselberghe's Telephone.

A new advance has been made by Mr. Van Rysselberghe, who has just devised a new system of telephone differing somewhat from all those known. The arrangements and details of the apparatus have not as yet been known to us, but the following result of some experiments that have just been made with it are communicated to *La Lumiere Electrique* by Mr. F. Geraldy:

The system had first been put in operation on the line from Brussels to Ostend, but its inventor, desiring to experiment with it to a greater distance, has just tried it between Paris and Brussels. * * *

Through the kindness of Mr. Van Rysselberghe, I was permitted to be present at the experiments on the 17th of May. I ascertained that conversation between Paris and Brussels was easy, that articulation was clear, and that it was not necessary to speak loud, but only in a clear and distinct voice—that, however, being acquired by the telephone.

Such a result, were it the only one obtained, would, doubtless, not be absolutely new, for our readers will recall the experiments at great distances with the Herz system, that we have had occasion to describe. Various attempts of this nature have been made with more or less success, but we may say that that of Mr. Van Rysselberghe has succeeded better than any that has been tried. But that is only one feature of the system.

The inventor has bestowed his attention on a means of overcoming that terrible enemy of the telephone, induction. On this subject I recall anew the studies made by Mr. Herz on a means of employing the condenser in telephone lines as a preserver as well as a receiver. The process employed by Mr. Van Rysselberghe has some points in contact with those experiments, while very sensibly different from them. Mr. Van Rysselberghe, by an ingenious detour, instead of guarding against induction on the telephone line where it produces an injurious action, endeavors to prevent its occurrence by suppressing it in the lines on which it is produced. To this point we shall hereafter return more in detail. He has experimented however, only imperfectly at Paris, where there was no time during the first experiments, designed only as a study, to provide all the prejudicial lines with preservative apparatus. The partial experiments have, however, sufficed to prove the efficacy of the process on telegraph lines.

From the combination of these two measures (I mean the improved telephone and induction overcome), Mr. Van Rysselberghe has derived an unexpected and striking result: for he has succeeded in putting upon the same line, and in causing to operate at the same time, a Morse telegraphic apparatus and a telephone. I have seen these apparatus work at the same time, and it is beyond dispute that they do not perceptibly interfere with one another, the double transmission being effected without any difficulty. At the first trial, which took place on the 16th, there were transmitted simultaneously to Brussels two dispatches. The telephone dictated one (which it is unnecessary to reproduce here), while the telegraph was registering another, an entirely different one. These two dispatches were at once sent to their address. It should be remarked that they passed at 8:10 in the morning; that is to say, after the work of the office had been resumed, and when inductive actions were already very energetic. We shall study more at leisure the processes employed by Mr. Van Rysselberghe, but it has seemed to us well to call attention to these beautiful experiments at once after their occurrence.

Telephone Extension.

The Empire State Telephone Company have extended their lines to Troopsville, and also to Union Springs, N. Y. It is expected that the Aurora station will be completed and in operation this week. The present line from Auburn to Honeoye has been extended to Hemlock Lake and Livonia in Livingston county, and a new line has been extended from Canandaigua to East Bloomfield, Miller's Corners, and Honeoye Falls. This is intended for a through Rochester connection, and there only remains a gap of eight miles for the Rochester company to build to complete a through circuit.

The new line from Canandaigua to Naples, a distance of thirty-two miles, was opened for business August 1st, and has six intermediate stations and points on Canandaigua lake.

Clifton Springs, Shortsville, and Chapinville are now in communication with Auburn. Exchanges have also been started at Lyons and Penn Yan, and a "trunk line" from the latter point to Dresden, N. Y.

Pottsville's Telephone Facilities.

POTTSVILLE, Aug. 9, 1883.

The Eastern Pennsylvania Telephone Co. to-day finished the connections between this place and intermediate points on the east and Shamokin and Sunbury on the north and west. Pottsville is now telephonically connected with every city and important town within a radius of 60 miles, and the lines are being still further extended.

The Telephone and Induction.

The London *Electrician* says that the experiments of Herz and Rysselberghe prove that telephonic communication is possible over lines of considerable length, though the practical solution is not yet attained, due probably to the unsuitability of the instruments hitherto used. It is found, for instance, that though the thin steel diaphragm of the American type of telephone speaks with clearer articulation on short lines, than on longer ones the thicker plates of the Siemens gives far better results. Dr. V. Wietlisbach theoretically determined the maximum distance over which such communication is possible, considering the limiting effect of the nature of the conductor in the first place, and secondly, the interference of neighboring lines. On the first point the rate of transmission of electric waves is a function of the resistance and electrostatic capacity of the circuit, the increase in the product of these two quantities corresponding with diminution in amplitude and velocity of the wave. This retardation is also a function of the rate of vibration of the sound, so that if the assumption is made that each sound must have a duration of at least $\frac{1}{15}$ second, and a retardation of not more than $\frac{1}{100}$ second between the highest and lowest tones be allowed, the time limiting distance for an underground

The Growth of the Telephone Service in Toledo.

Manager Graves, of the Toledo Telephone Exchange, states that thus far this month he put in thirty-one new telephones, or a total of 126 since he assumed the management of the exchange about four months ago. In addition to this, the work of rebuilding the lines has been pushed forward, the result of which has greatly improved service in many portions of the city. When all the lines have been rebuilt, the local service will not be excelled in any city.

Those who have had any business relations with Manager Graves will unite in saying that he is the right man in the right place. Energetic, courteous and possessing all the qualifications of a business man, he has succeeded in building up the local exchange to an extent which is certainly flattering to himself and pleasing to the company. There are now about 675 subscribers, and the fact that Toledo has the largest exchange of any city in the country, comparing population, speaks volumes for the management.

The indications are favorable for the establishment of an exchange at Napoleon. Manager Graves went there one day last week, and in a few hours received substantial encouragement. Just as soon as fifty subscribers are secured an exchange will be started there, and connected with both Toledo and Defiance, thus giving Napoleon equal facilities with Toledo. About half the necessary number of subscribers has been secured, and the citizens are bound to have the exchange.

Mexican Telephone Items.

"The Mexican Telephone Company never was in a healthier state than at present," said a well-known telephone man, of Boston, a few days since. "We can almost see the end of our difficulties at this end of the line; and within a short time, from present indications, we will have met and conquered all the obstacles that have beset us, and almost swallowed us up, body and soul. That we have survived is the wonder of many who have been disinterested observers. However, these matters are gradually working themselves out to the satisfaction of the company, who see, for the first time in many months, the prospect of building up a good-paying property in Mexico. With Geo. Wiley as general manager, and exerting himself to the utmost to push matters to a successful issue, I see no reason why we should feel the least anxiety." He has the whole charge of our affairs now, and from what I know of his abilities and straightforward character, I am confident of his ultimate success in building up a good-paying telephone property. The telephone line between Puebla and Tesmelucan are in operation, and doing good service. The rates in Leon have been reduced to $3 per month, and everything looking as bright as could be wished for under the circumstances."

General Superintendent John Cassidy, of the Hawaiian Bell Telephone Company of Honolulu, H. I., made us a very pleasant call on Monday last. Mr. Cassidy reports splendid progress in the telephone field there. The Honolulu exchange has 350 subscribers. This is the largest number of subscribers for the population (which is but 14,0 0) that we know of in the world. Mr. Kennedy contemplates introducing an electric light system there at an early day. It will be a success, without doubt, if the enterprise is under his management.

That Wicked Telephone.

ELECTRICITY ALMOST BREAKS UP AN INNOCENT MAN'S FAMILY.

"I guess I haf my telephone took out of my house," said a resident of the eastern part of the city, as he took a seat beside Manager Jackson the other day.

"Anything wrong?"

"Yes, eafaytings is wrong," was the doleful answer.

"Perhaps the battery needs more water?"

"Vhell, maybe so; but I doan' keep no track of dot. You see, I vhas down to my peesness a good deal. In der morning, after I vhas gone a leedle while, somepody rings aboudt 1600 times and scares my old vhoman half to death. She asks who vhas dere, und somepody answers: 'Hello, Shake! vhas dot you? Say, Shake, how aboudt dot leedle gal dot wrote you dot letter? Ha! ha! ha!' Und dot makes my vife so madt dot she shumps oop und down und pulls her hair, und vhen I comes home she goes for me like some tigers. Vhos dot der right vhay to put up some shobs on a man?"

"No, of course not."

"Und pooty queek after dot somepody else rings oop my house two dousand times, und my vhife almost faints avhay. Vhen she asks who vhas dere somepody answers: 'Say, Shake, I saw you riding oudt mit your vhife on der Lake road last Sunday. Doan' be afraid—I doan' give him away!' Und den my vhife vhas madt enough to bust in two, und vhen I comes home she sthrikes at me mit der teapot. Do you call him telephone convenience?"

"I call it a shame, sir."

"Vhell, some odder times somepody goes r-r-r-ring-ing-ring like tunder, und my vhife vhas as pale ash a bedquilt. She tinks dot vhos some occident to me, or some steampoat blowed oop mit her sister. Her heart beats like it would shump oudt on der floor, und vhen she asks who vhas killed, somepody answers: 'Ish dot Shake? Say, Shake, how much you gif dot policeman to keep sthill on you eh? Ah! Dot vhas a fine racket, but if der oldt vhomans drops on it vhas gone oop like some Gilderoy's kite!' Den my vhife she vhas madt some more, und she packs oop her trunks, und she vhas all ready to go vhen I comes home. Vhas dot some more convenience by electricity?"

"I shall certainly look into the matter. Such things must be stopped."

"Und sometimes somepody rings softly, shust like cats, und my vhife wants to know who vhas dot. Me! Who vhas me? Katie! Who vhas Katie? Vhy, Shake, doan' you know vhot vidder vhomans you met on der boat? Say, Shake, how vhas der oldt vhomans to day? Und how vhas dot on me vhen I goes home? Und how can I make der oldt vhomans pelief I vhas in my saloon all der time, und dot I doan' know some vidder vhomans from a load of hay? I tell you, Misser Shackson, dot telephone preaks oop my family if I doan' look oudt. Eafery day it is 'Hello, Shake!' und eafery evening vhen I comes home it is some more crying und talking like I vhas der vhorst man in Detroit."

He was promised speedy and permanent relief, and as he backed up stairs to the sidewalk he said:

"Vhell, dot makes me feel like I vhas happy. If somepody vhants to 'Hello, Shake!' on me, let him come to my saloon. I gif him some telephone convenience so he vhas lame for six months!"

A white-hot meteor fell near Governor's Island, in New York harbor, last Monday, and the same day, in perfectly clear weather, the wires of a telephone office were found to have been melted by an electric current far greater than any they could have received from the batteries. It seems reasonable to connect these two incidents with each other as showing an exceptional electric condition of the atmosphere.

Telegraph Extension to Cinnabar, Montana.

A Western Union line has been completed to Cinnabar, Montana, fifty miles south of Livingstone, on the Northern Pacific Railway, from which point messages to the Hot Springs Hotel, Yellowstone Park, are delivered free by pony express. The President and party will be the first to use the line. Dr. Norvin Green, president of the Western Union Telegraph Company, is at his office to-day, after a several months' trip abroad. The doctor was warmly welcomed by the officers and employes of the company. His trip has been of great benefit to his health, which he declares is better than it has been for many years.

There is a telegraph operator at Pensacola who takes no heed of strikes. He gets ten dollars a day, because of the presence of yellow fever in the town. He does not meet with active competition, even with his fancy salary as an inducement to other operators to divide the field with him.

The cable between Trinidad and Demerara has been repaired.

A New Telegraph Company.

Starting with a capital stock of $1,300, but which it may increase at its will, the Postal Union Telegraph Company proposes to build a telegraph system which shall connect all the large cities of the United States and Canada, and which shall have an outlet to Europe by way of a submarine cable that is to land at or near North Eartham Light, Cape Cod, Mass.

The certificate of incorporation and articles of association of the new company were filed in the County Clerk's office yesterday. Its coporators are:

Henry C. Gardiner, Andrew W. Kent and Joseph Wittgenstein of New York; Wm. J. McAlpine of Bay Ridge, L. I., and Dumont Clarke of Creskill, N. J.

Of its thirteen shares of stock Messrs. Gardiner and Kent each hold 5, and Messrs. McAlpine, Clarke and Wittgenstein each 1 share.

Building Telegraph Lines.

A PRACTICAL CONTRACTOR'S OPINION BEFORE THE SENATE SUB-COMMITTEE.

NEW YORK, Aug. 17, 1883.

Daniel L. Robeson, telegraph engineer and contractor, was the first witness examined by the United States Senate Sub-Committee on Education and Labor. He said he had seen McClellan's estimate of the cost of the construction of a telegraph line of 8 wires from New York to Chicago, wherein the latter said it could be completed for operation for $725,965. This, witness thought, was about half of the real cost of construction. Such a line would cost at least $1,000 per mile. He was not prepared to give any detailed estimate of the cost of construction and equipment, and for this reason Senator George said he thought the opinion of witness was of not much value as evidence.

A warm controversy ensued between the Senator from Mississippi and Senator Blair, the Chairman, who accused his colleague of discourtesy to the witness in interrupting the latter by any such expression of opinion.

Senator George replied that he proposed to take up as much time as he liked in questioning the witness, and insisted upon a complete statement of the cost of each item of expense in construction.

Witness refused to answer the question any more definitely than he had done, as he said he thought it would be contrary to his interest to do so.

In regard to the rights of way, witness said he had known of cases where over $1,000 had been paid for the privilege of erecting six poles. This item was probably the most important in the cost of construction. On some routes the cost of the rights of way were much larger than on others. The most expensive route in this respect would be, he thought, that of a line between Washington and Boston, and the right of way between Washington and Chicago could not be acquired except for a large consideration. Providing he had the right of way possessed by the Western Union, Robeson asserted that he would willingly undertake to reproduce the entire telegraph system of this country for $10,000,000 and would hesitate at $30,000,000. The most valuable rights of way possessed by the Western Union were those obtained from the railroad systems of the country and no estimate could be formed of the cost to the Western Union of acquiring these easements. The ordinary expense connected with this item is incurred in obtaining rights of way through cities. This was usually placed under the head of legal expenses, for lawyers were usually employed to obtain the privilege in these cases. Witness had been engaged in the construction of the Mutual Union, American Rapid and several railroad lines.

The Southern Telegraph Company.

COLUMBIA, S. C., Aug. 8, 1883.

The Southern Telegraph Company is making rapid progress in its work of construction. The line from Charleston to this city and that from Charlotte will soon be completed to this point. Gangs of hands are at work erecting poles from Columbia to meet the forces coming this way. The office in this city will probably be the receiving and distributing point, holding the same relation to the business of the company as Augusta, Ga., holds to the Western Union. The company has met with no difficulty in obtaining the use of the streets here, nor in securing an excellent office location.

Telegraphing 250 Years Ago.

In your issue of Sunday, August 5, under the heading of Scientific Gossip, you say that "the Chevalier Frederic Franchetti, engineer at Leghorn, referred M. de Parville to a curious passage in Galileo's Dialogues touching the possible origin of the electric telegraph."

I find the same in Dialogue I, page 97, in "Thomas Salusbury," translation printed by William Leybourne, London, 1661, viz:

"*Sagrado.*—You put me in mind of a man who would have sold me a secret, how to correspond by means of a certain sympathy of magnetic needles, with one that should be two thousand or three thousand miles distant, and I telling him that I would willingly buy the same, but that I desired first to see the experiment thereof, and that it did suffice me to make it, I being in one chamber and he in the next, he answered me that in so small a distance one could not so well perceive the operation; whereupon I turned him going, telling him that I had no mind at that time to take a journey to grand Cairo or to Muscovy to make the experiment; but that if he would go himself I would perform the other part—staying in Venice."

In the margin it says: "A jest put upon one that would sell a certain secret for holding correspondence with a person a thousand miles off."—*New York Times.*

A Postal Telegraph.

General Huidekoper, postmaster of Philadelphia, has no doubt that telegrams can be delivered by letter carriers in cities as quickly—at least to those parts distant from telegraph or post-office centers—as the telegraph companies now send them. General Huidekoper says on this point:

One hundred and fifty-six of our carriers are taken from this office four times a day to distant parts of the city by wagon, and brought back again immediately after they have made each delivery, so that they can reach their routes without suffering the detention which they would if they were transported by street cars; and I am inclined to think that telegrams now received in this city for points two miles from the central office are not now delivered as promptly as if they were intrusted to the city delivery department of this office for carrying. Of course, in the business center of the city the delivery of letters should be made every hour; and if the delivery of telegrams was also a part of our business an intermediate delivery could readily be made of these. I think every one who lives in the outskirts of Philadelphia or in the suburbs believes that telegrams are not now delivered until a sufficient number accumulate to warrant the sending out of a messenger, and that the postal service is now almost as rapid between the central office and sub-stations as the present telegraph service.

As to country offices he makes the following useful suggestion: "It seems to me that the postal service should be extended to every post-office in the United States by having certain post-office centers from which telegrams could be distributed by mail. For instance, a telegram sent from here to a small post-office fifteen miles from Chicago could be sent to the Chicago office and mailed there—the sender being informed at this office as to when the mails for the office of destination would leave the Chicago office, and the telegrams could be sent with reference to the time on schedules so as to make the proper connections."

The Youngest Operator.

We had the pleasure of meeting and witnessing the expertness of Miss Brown, the infant telegrapher of the world. She is only 6 years old, and is certainly one of the greatest wonders of her age. Her father, who will probably rank as an average operator, is much inferior as to ability in distinguishing the sound and the rapidity with which she does it. She has just received a second reader, and seated on one side of the table on which were arranged the instruments, the father seated himself at the key and wrote from the book one page of reading matter at the rate of 30 to 35 words a minute, and the little marvel succeeded in getting the entire page without a single break, her father being determined to send faster than she could take, but with the greatest speed he could send, failed to do so. Her father confesses that she is much more accurate than he, and there is no doubt but with proper care and training she is destined to make one of the finest operators in the world.

At present her greatest difficulty is her inability to comprehend and arrange together long and difficult words, and being a mere child and unable to write, she has either to have some one to take the message down for her or remember it in its entirety, which in a long message is impossible.

The Pledge to Renounce the Brotherhood.

The Western Union Telegraph Company is slowly finding places for the operators who were out on strike. Not all of the branch offices closed by the strike have been opened, because operators who return and find their old places occupied refuse to accept less lucrative ones. The following is an official copy of the agreement which the returned operators are required to sign:

WESTERN UNION TELEGRAPH COMPANY—AGREEMENT WITH RE-EMPLOYED TELEGRAPHERS.

I, ——, of ——, in consideration of my present re-employment by the Western Union Telegraph Company, hereby promise and agree to and with the said company that I will forthwith abandon any and all membership, connection, or affiliation with any organization or society, whether secret or open, which in anywise attempts to regulate the conditions of my service, or the payment therefor, while in the employment now undertaken.

And I do hereby further agree that I will, while in the employ of said company, render good and faithful service to the best of my ability, and will not in anywise renew or recount upon any relations or membership whatsoever in or with any such organization or society.

Dated ——, 1883.

[Signed] —— ——.
[Address] [Seal.]

Accepted for the Western Union Telegraph Company.

—— ——,
Superintendent.

The scarcity of gentlemen at a summer resort was so apparent that a Boston lady telegraphed to her husband: "George, bring down a lot of beaux for the hop this evening." Thanks to the telegraph manipulator, George arrived with a "pot of beans."

The National Telegraph Co. was incorporated August 20th. The capital stock is fixed at $25,000, with the provision that it may be increased to $10,000,000. The stockholders are Calvin S. Brice, Lima O. Franks, E. Worcester, Brooklyn, and John W. Simpson, Herbert L. Terrill, Walter Katte, and James E. Childs, New York. The official position of the incorporators may be significant as indicating who the real backers of the enterprise are. Mr. Brice is one of the most active and conspicuous members of the Seney syndicate, and, like Mr. Terrill, is a director in the East Tennessee, Virginia, and Georgia Railroad Company, which is controlled by that syndicate; Mr. Worcester is treasurer of the New York, West Shore, and Buffalo Railroad Company; Mr. Childs is general superintendent and Mr. Katte chief engineer of the New York, Ontario, and Western Railroad Company, and Mr. Simpson is a member of the law firm of Alexander & Green, some of the members of which are, according to all accounts, largely interested in the West Shore road.

Left in Error.

He was only a district messenger boy,
But messenger boys are male and human,
And therefore qualified to enjoy
A look at a young and lovely woman.

The boy I sent with a note to-day,
Came back intoxicated, crazy,
And ventured to very frankly say: [daisy."
"That gal, your mash, she's a—she's a

The boy was wrong; she was not my mash,
It's only once that by chance I met her;
The note he carried was not a rash
Love screed, but simply a business letter.

But he looked at me with a glowing face,
Which spoke of envy and admiration,
And I didn't think it was just my place
To enter into an explanation.

If you call it teleg-rapher, you are almost invariably stared at, and your interlocutor responds with a mystified, "What?" When it comes to pronunciation, the dictionary-makers are an insignificant minority.

When the editor proposed and was accepted, he said to his sweetheart: "I would be glad if you would give me a kiss;" then, observing her blush, he added, "not necessarily for publication, but as a guaranty of good faith." She could not resist that.

Postal Telegraph Schemes.

STOCKHOLDERS VISIT THE GREAT WIRE MILL AT ANSONIA, CONN.

ANSONIA, CONN., Aug 20.—The mills of the Postal Telegraph Company were paid a visit Saturday by several of the stockholders. These were Mr. J. W. Mackay, the bonanza king of California, a recent acquisition to the company, and Messrs. H. L. Horton and George D. Roberts, of New York City. Mr. Horton was accompanied by his wife. On arrival, the large mill of the company, which is located here, was inspected, and the several processes of wire manufacture viewed with much interest. It was Mr. Mackay's first visit to the mill, and he expressed the greatest satisfaction with the plant, and regarded the details of manufacture with special pleasure. An order was given during the visit for the working of the mill to its fullest capacity, and on Monday morning the order will be put into effect. An extension of the mill, now covering a greater area of land than any other single mill in the place, is also proposed, and will probably be ordered in a few days. This begins to look as though the Postal Telegraph Company really meant to begin a strong competition for the telegraph business of the country. After the inspection of the mill the visitors were escorted through the extensive works of Wallace & Sons, and dined at the Bassett House. They left in the afternoon.

An old lady, hearing of the strike of the wire drawers, exclaimed: "Wire drawers! Gracious me! What new-fangled thing will folks be wearing next?"

During the telegraph strike, a man who has charge of an office among the hills of Arkansas, where the receipt of a message is a sensational event, telegraphed as follows to headquarters: "The news of the strike caused considerable excitement at this place, but at this time all the regular force is at work. If the strike assumes the shape of threatened disaster, I'll telegraph at once. In the meantime rest easy."

The London *Athenæum* states that Mr F. Varley has devised a new form of electric lamp. His carbons are made of twisted hemp fibers soaked in ozokerite, and carbonized in a crucible filled with some hydro-carbon vapor. This carbonized hemp is flexible; it can be wound on a reel and moved out by clockwork. The arc between the poles is said to be saturated with incandescent carbon, that the resistance is much reduced, and the light of greater area.

The electrical current: The craze on electrical study is beginning to bear fruit. "Are you the conductor?" asked a lad on an excursion train. "I am," replied the courteous official, "and my name is Wood." "Oh, that can't be," said the boy, "for wood is a non-conductor."

A Fact to Jot Down.

"Is the man mad?"

"No, the man is not mad."

"Then what makes him yell so?"

"He is talking to a man a mile away."

"Through that little instrument?"

"Yes; through that little instrument of torture called a telephone."

"Will he make the man a mile away hear?'

"Certainly he will."

"But he could do it just as easily by yelling out of a window."

"Why, does not the telephone work?"

"No; it does not work; the man using the telephone works. Jot that down in your mem."

A street-car conductor carelessly carried his bell-punch home and allowed his children to play with it. The next day the company informed him that he was 9,999 fares short. He has offered to leave the children in pawn until he makes up the money.

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We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, AUGUST 30, 1883.

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TARDY JUSTICE.

The Admirable Work of an American Electrician in Paris.

THE ELECTRICAL ENGINEER OF THE "SOCIETE GENERALE DES TELEPHONES"—MR. R. G. BROWN'S INGENIOUS PLAN FOR GENERAL TELEPHONE SERVICE—HIS COADJUTORS, MM. LARTIGUE AND BERTHON—WHAT PERSEVERANCE AND INGENUITY CAN ACCOMPLISH—M. TH. DU MONCEL DESCRIBES THE EFFICIENCY OF THE SYSTEM. THE "MONITEUR INDUSTRIEL" CONGRATULATES AN AMERICAN ELECTRICAL ENGINEER.

In the ELECTRICAL REVIEW of June 28, July 5 and 12, we gave a detailed description of the Telephone Central Office in Paris, and attributed the conception of the admirable system which obtains there to MM. Lartigue and Berthon. In so doing we find we have done signal injustice to our fellow-countryman, Mr. R. G. Brown, electrical engineer, and we hasten to make amends. The articles referred to, as plainly stated at the beginning of each, were translated for the REVIEW from *La Lumiere Electrique*, and, therefore, since they did not originate with us, we feel we will be held innocent of any intent to withhold credit where it is due.

Nevertheless, on our own account, we must confess we feel somewhat mortified at thus neglecting the just claims of Mr. R. G Brown, because we know him to be an electrician of unusual ability; a man of original ideas and withal a credit to the profession.

In these days of charlatanry, quackery, and buncombe, it is refreshing occasionally to meet with a man in whom ability and honor go, as one might say, hand in hand. Such a man is Mr. R. G. Brown, and we propose to ourselves the agreeable duty of setting our countryman right before those of our readers who are, perhaps, not informed concerning the inception and working of the admirable system now in operation in Paris, and thus make up for the singular lack of fair play which the publication *La Lumiere Electrique* has shown itself capable of countenancing. We use this phrase advisedly, for, as we propose to show, it were as absurd to describe the Paris telephone system and not mention the name of Mr. R. G. Brown, as to present the play of *Hamlet* with the title rôle omitted.

In this our design to do justice to the claims of Mr. Brown, however, we will not take the witness stand ourselves, for were we so to do it would give the incredulous the idea that we had some reasons for urging his claims, which is not the fact. We will, therefore, content ourselves with repeating what we said before—that we know Mr. Brown to be an enterprising, able, and reputable electrician; and allow that eminent and reliable electrician, M. le Comte Th. du Moncel, member of the Institute, to speak concerning the part he has taken in the particular enterprise of which the REVIEW has already said so much.

In his new volume "Le Téléphone," du Moncel does not hesitate to accord to Mr. R G. Brown the first place among the three electricians by whose united efforts the system now in use by the *Société Générale des Telephones* was perfected; invariably speaking of Mr. Brown first and of the two French electricians who assisted him afterwards. Du Moucel speaks in flattering terms of the ingenuity of the American electrician, He recognizes the quality of the difficulties which he had to contend with in joining together for the first time the good points of several telephone systems and omitting the defects of each. Du Moncel, skilled in electrical science himself, points out the admirable contrivances invented by Mr. R. G. Brown, and by which he was finally enabled to remove obstacles, which to those around him seemed unsurmountable. Unlike his compatriots of the publication *La Lumiere Electrique*, he does not stoop to set aside the just claims of a worthy man because he is not of his own nationality, but with the generosity which is usually begotten of integrity, talent and candor, he bluntly ascribes to the American electrician the inventions which have made the Paris telephone system a model of ingenuity and efficiency. Mr. R. G. Brown arrived in France July 20th, 1879, and almost immediately thereafter, the *Societé Generale des Telephone* having discovered his trustworthiness, appointed him its electrical engineer; an office which he has held ever since.

As may be supposed, it was by no means an easy task for an American to secure and retain a position of so much importance and prominence as that of chief engineer in the principal telephone company in France, a company having a capital of twenty-five millions of francs. The claims of many Frenchmen were pushed in the board of directors, but the ability which the American had shown in meeting and overcoming difficulties stood him in good stead, while he splendid work he had already accomplished gave him a claim upon the gratitude of the Board.

In refreshing contrast to the narrow-mindedness and petty jealousy of the publication *La Lumiere Electrique* is the article in a recent number of the *Moniteur Industriel* on the Systéme Telephonique *Central de Paris* by M. A. L. Ternant, director of the Eastern Telegraph Company at Marseilles.

In this Mr. Brown's services are continually referred to in terms of the highest praise. The writer begins by describing the many difficulties which stood in the way of a perfect system in Paris, and then speaks of "the remarkable report presented to the administrators of the *Societe General des Telephones* by the American engineer, Mr. R. G. Brown, and of the effect this report had upon the directors who finally adopted it."

It pointed out, so says the writer, in concise language, a practical and inexpensive means of beginning the workings of a system which might not unreasonably be expected even by short-sighted persons to undergo a grand development in such a city as Paris Such indeed was the case. The service grew by jumps and leaps, and as this was just what had been anticipated by the author of the system, who had arranged it with that object in view, there has been few delays and no real trouble from the inception of the enterprise up to the present time. But of the three men to whose united efforts the present perfection of the Paris system is due, the most credit belongs to Mr. R. G. Brown an American electrician.

Science in the Hen-house.

When an ingenious Connecticut man succeeded in making nutmegs out of mahogany, further competition between the several States of the Union ceased for a time, it being conceded by all that to Connecticut belonged the palm. Later on, however, a Massachusetts man discovered that it was an unnecessary hardship to compel bees to make their own comb; that is to say, that it was a useless waste of time for bees to make the hexagonal cells in which they are wont to deposit honey, and he forthwith made these cells himself out of wax by the aid of machinery. Later on he hit upon the somewhat striking proposition that man could make honey as well as bees, and so he immediately set about the task and found no trouble in making honey out of glucose. Now, as a bushel of corn costing thirty cents will make a dollar's worth of glucose and three dollars' worth of glucose-honey, this ingenious Yankee, as may be supposed, developed a profitable business His neighbors, it is said, insisted that they preferred what they termed old-style honey, viz.: that made by bees; but, notwithstanding the narrow-minded opposition of these old fogies, he succeeded in making a market wherein corn-honey, so to speak, was in active demand.

Nowhere was this demand so great as in England. It had been a bad year for honey in England, and lovers of the article had almost become resigned to their honeyless fate when, suddenly, large cargoes of that delicious food arrived from America.

American apiaries must be very prolific this year! argued the simple English, as they eagerly purchased the newly-arrived honey.

An ancient authority has explained that violin music is caused by scraping the tail of a horse over the entrails of a cat. In like manner it may be said that artificial honey is made by pouring the juice of the corn into myrtle or candleberry wax. It was an ingenious idea, developed by an ingenious man; but somehow the English, after consuming large quantities with guileless confidence, suddenly discovered their mistake and, notwithstanding the assurance of its manufacturer that it was better than bee-honey, they were so hard-hearted as to refuse to eat any more of it. When this decision of the English was made known to the Massachusetts honey-maker he is said to have been much prostrated, and, remarking that the English were an exacting, unreasonable people, he broke up his artificial apiary and returned to shoemaking, a shattered man.

It is well for him that he did so, for he is thus spared the mortification of being worsted in his own field; of having the laurel snatched from his brow. New Jersey comes for the first time to the front for ingenuity, and the prestige of Connecticut and Massachusetts is gone forever. And very properly should New Jersey be given the front rank for one of her citizens has discovered a means of imitating the hen by machinery. That is to say, he has learned how to make artificial eggs by the thousand, and in his factory in Broad street, Newark, he turns them out by the ton. This is the very acme of ingenuity, this the very apex of applied science. No more need the farmer's wife search the hay loft and the adjoining pasture for the fruit of the hen; no more need the hen be kept; the hen that tears up the garden and necessitates the presence of roosters that call the coming day before it breaks and set the children examples of a quarrelsomeness of disposition usually accorded only to the cats of Kilkenny.

This ingenious New Jerseyite has discovered how to prepare both what is ordinarily called the yolk, the white and the shell. One great vat contains the first, another the second and still another the lime for the shell. Thousands of eggs are made at a time, the yolk being first got ready is made into innumerable balls the size of those usually found in eggs. These are frozen and then surrounded by the white, which is similarly treated; then a thin skin is formed about each egg and finally all are dipped in a solution of lime which leaves them with shells almost the exact counterpart of the natural article, being the same color and shape, but somewhat thicker, the inventor explaining this, which seems to be intentional, by saying by that such a thickening of the shell the egg may be preserved for a much longer period His eggs, he says, may be kept for several years without altering their flavor, which a correspondent of our contemporary who ate one, says is very good and does not differ essentially from that of the hen's egg.

It would seem to be our duty to herewith warn the English of the newly-invented egg which is likely very soon to make, if it has not already made its appearance among them in large quantities. Yet if, as is said, the artificial egg resembles the natural product of the hen in color and shape and taste, we don't see how they are to distinguish between them. But whatever is the outcome of this advance in New Jersey science, we hope the credit for this imitation of nature will not be laid at the door of the United States, for it is well known that the question whether or not New Jersey belongs to the United States has never been absolutely settled; there being many persons in this country at the present writing who are wont to describe New Jersey as a "foreign country," and should any international complication arise in Great Britain concerning this artificial egg question, the latter power will be compelled to treat directly with New Jersey, and as New Jersey was never known to give in yet, whether upon a question of law or a question of fact, the discussion, if discussion there be, is likely to be exceedingly interesting.

Subscribers will receive index to Volume II. with the next edition of the REVIEW.

The grand consolidation of telephone interests in New England has been postponed for the present.

Electrical Notes.

It is more than likely that in the future the power generated by the ebb and flow of the tides, and their vertical rise and fall, will be utilized by means of electricity.

***

Therefore everything concerning tidal phenomena is likely to prove of interest to the electrician.

***

To be sure, some electricians being scientists in the broad sense of the term, know as much about tidal phenomena as there is to be known, and I do not flatter myself that I can give them any information concerning this very interesting subject.

***

But, as is well known, there are many who are what is called practical men, who have had little time for study, and to these a few notes on tidal phenomena and the correction of a few common misapprehensions concerning them may not prove uninteresting.

***

It has been known to seafaring people from a remote antiquity, that there was a singular connection between the ebb and flow of the tides and the diurnal motion of the moon.

***

Cæsar's description of his passage across the English Channel shows that he was acquainted with the law.

***

In describing the motion of the moon, it was shown that, owing to her revolution in a monthly orbit, she rises, passes the meridian, and sets about fifty minutes later every day.

***

The tides ebb and flow twice every day, but the corresponding tide is always later than the day before, by the same amount on the average that the moon is later.

***

Hence, at any one place, the tides always occur when the moon is near the same point of her apparent diurnal course.

***

The cause of this ebb and flow of the sea, and its relation to the moon, was a mystery until gravitation showed it to be due to the attraction of the moon on the waters of the ocean.

***

The reason why there are two tides a day will appear by studying the case of the moon's revolution around the earth.

***

Now, strictly speaking, the moon *does not* revolve around the earth any more than the earth around the moon, but by the principle of action and reaction the center of each body moves around the common center of gravity of the two bodies.

***

The earth being eighty times as heavy as the moon, this center is situated within the former about three-quarters of the way from its center to its surface.

***

The body of the earth itself being solid, every part of it in consequence of the moon's attraction may be considered as describing a circle once in a month.

***

The centrifugal force caused by this rotation is just balanced by the mean attraction of the moon upon the earth.

***

If this attraction were the same on every part of the earth, there would be everywhere an exact balance between it and the centrifugal force.

***

If the waters everywhere yielded immediately to the attractive force of the moon, it would always be high-water when the moon was in the meridian, low-water when she was rising or setting, and high-water again when she was in the middle of that portion of her course which is under the horizon.

But, owing to the inertia of the water, some time is necessary for so slight a force to set it in motion, and, once in motion, it continues so after the force has ceased and until it has acted some time in the opposite direction.

***

Therefore, if the motion of the water were unimpeded, it would not be high-water until some hours after the moon had passed the meridian.

***

Yet another circumstance interferes with the free motion of the water—viz., the islands and continents.

***

These deflect the tidal-wave from its course in such a way that it may, in some cases, be many hours behind its time, or even a whole day.

***

Sometimes two waves may meet each other and raise an extraordinarily high tide.

***

At other times the tides may have to run up a long bay, when the motion of a long mass of water will cause an enormous tide to be raised.

***

On the Bay of Fundy, both of these causes are combined.

***

A tidal wave coming up the Atlantic coast meets the ocean wave from the East, and entering the bay with their combined force, the water at the head of it is forced up to the height of sixty or seventy feet, on the principle seen in the hydraulic ram.

***

The sun produces a tide as well as the moon, the force which it exerts on the two sides of the earth being the same which, acting on the equatorial protuberance of the earth, produces procession.

***

The tide-producing force of the sun is about $\frac{4}{10}$ of that of the moon.

***

At new and full moon the two bodies unite their forces and the result is that the ebb and flow are greater than the average and we have the "spring tides."

***

When the moon is in her first or third quarter, the two forces act against each other; the tide-producing force is the difference of the two; the ebb and flow are less than the average, and we have the "neap-tide."

***

The great advance which has been made of recent years in applied science, has resulted in making interesting to the general public those things which heretofore have attracted the scientist and the student.

***

So far has the interest extended that even the colored population has become interested and the colored preachers, not to be behind, their lay-brethren, seem to have become, to a certain extent, scientific skeptics.

***

The substitution of scientific topics for pulpit discussion, in place of those purely doctrinal, is said to be a sign of the advancing civilization of which so much is heard.

***

That the old beliefs are being looked upon by many with growing doubt, there is almost daily proof.

***

The discussion of secular themes is, however, by no means confined to the white ministers. Their colored brethren occasionally take a hand also, and awake thunders of applause by their conclusive arguments.

***

Thus it was that the Rev. Mr. John Jasper, pastor of the Zion Colored Church, in Richmond, Va., being unwilling to accept the theories of the astronomers as to the sun, preached, some time since, a sermon on the text, "The Sun do Move," in which, after a lengthy argument, he showed conclusively that the astronomers were correct.

***

Later, another colored clergyman examined into the question as to whether or not the earth was flat.

***

He decided that it was.

***

Not to be outdone by his fellow-clergymen, the Rev. Mr. Thomas Jackson, of Hot Springs, Arkansas, determined recently to inquire into the truth of some of the legends that have been handed down from generation to generation, and are generally accepted without investigation.

***

The question he selected for discussion—"Was Adam a Black Man?"—excited so much interest among the colored population of that town that the church was found to be inadequate to contain the people who desired to take part in the discussion, and the town hall was obtained.

***

The Rev. Mr. Jackson then chose a jury of twelve men, to which the evidence *pro* and *con* was to be presented.

***

The following resolution was then put: "Resolved, That Adam was a colored man."

***

Mr. Marcus Tullius Cicero Wright and the Rev. Mr. Jackson were for the affirmative, and Messrs. G. Washington Brown and Samson Jenkins for the negative.

***

It was reserved for the Rev. Mr. Jackson to open the debate by speaking to the resolution. "Why, jes' look a-here," he began, in a voice that carried conviction with it, "de Bible as much as say dat Adam was black. It say dat de Lord put his mark on Cain, who was de son ob Adam, and turned him white and cast him fort—a leper—dat is to say, whitened."

[A Voice—"Kalsomined, I reckon."]

***

Mr. Jackson looked scornfully at the man who had made the remark, and continued:

***

"Did anybody in dis room ebber see in de Bible dat Adam was a white man? Ef he did, let him hole up his right han'! Well, now, if it don't say nuthin' about his bein' white, he mus' hab been black."

***

The strength of this argument made a profound sensation throughout the hall, and was such as to change the minds of many who theretofore believed Adam to have been white.

***

"Now came Mr. G. Washington Brown's turn to be heard. "There can be no question," he began, "but what Adam was a white man. Ye see," he continued, "in dem days any sinners was black; for do not de Lord say dat de Lamb was white, and dat its blood would wash de blackest sinner white? Den, ag'in, de Bible say dat Adam was made like his Creator. Now, de Book ob Revelations say dat de face ob de Creator was so bright dat it lighted up a whole city. Now, I leab it to you could a nigger light up anything wid his face?"

***

This was too conclusive to admit of any doubt, and without further argument the jury decided that "Adam was not a black man."

***

Those who have had to constantly refer to what are known as the text-books in physics have, no doubt, been much perplexed by reason of the constant recurrence of such antiquated and misleading metaphorical expressions as "positive and negative fluids," "density or thickness of stratum of electricity," "repulsive force," "accumulation of electricity on the outer surface of conductors," &c.

***

What is very much wanted in "electrostatics" is a plain, straightforward account of electrical phenomena and quantitative results based on dynamical principles only and avoiding as far as possible all puzzles, or else have them collected under a perfect title, so that those who are not disposed to cudgel their brains may be enabled to give them a wide berth.

***

Here are some points which it may safely be said are not brought out with the clearness which their importance demands. They have been pointed out by a prominent authority.

***

That there is one, and only one primary form of electrical energy which we recognize by its tendency to approach and to make the matter with which it is associated approach, other portions of matter (compare gravitation).

***

That the so called "separation of the neutral fluid into positive and negative fluid," and the "accumulation by induction of an opposite charge on the nearest points of a conductor," is simply a way of stating a case falling under the third law of motion, viz.: that the action of a force is always accompanied by a reaction equal to the force and in the opposite direction.

***

We ought no more to talk about positive and negative electricities than about positive and negative cohesion or elasticity in a stretched spring because the ends tend to move in opposite directions, and stress cannot be put on one end without causing an equal or opposite stress at the other end.

***

That the whole mass of a piece of matter to which electrical energy has been imparted (by the conversion of other forms of energy into it) is in a state of stress or strain although dynamical effects are only obtainable.

***

That is to say—where there is a change of medium (compare the case of radiant energy, heat and light. Some form of energy is transmitted through the matter in space, which is converted into heat or light when the medium is changed, *e. g.*, from air to metal.) This is the fact expressed misleadingly in the old terms "accumulation of electricity on the surface of conductors."

***

Where induction is possible, or, to state the fact better, when matter with a different amount of electrical energy in it (*i. e.* at a different potential) is in the field of the electrified body.

***

That what we are practically concerned with in electrical energy is the amount of work it can do, *i. e.*, its potential; just as in the case of gravitation, which we are constant to measure (apart from all hypotheses as to vortices and molecular stresses) in terms of mechanical work. That when, and only when, there is difference of potential between two portions of matter work can be done by the electrical energy, and we get "manifestations of electricity" as the text-books put it.

***

That the effect on molecules in the neighborhood of an electrified mass is the resultant of all the forces of the individual molecules of the mass. The direction of this resultant is a "line of force." All lines of force pass through a certain point in the mass, which may be called the "center of electricity," just as lines of gravitation force pass through the "center of gravity"

***

That electrical potential, as all other radiant forces, falls off rapidly with distance from the center of electricity. Points may be found along the lines of force where potentials are equal, and the surfaces in which these points lie are called "equipotential surfaces" These latter are disposed symmetrically round the center of electricity.

***

Examples of the mode of accounting for

such phenomena as the action of points, inductive separation of $+E$ and $-E$ in conductors, condensation of electricity, &c. *A.* Action of points.

***

Every part of a conductor is at the same potential, but it is situated in a medium of molecules at different potentials, their condition being defined by the equipotential surfaces. Hence, except at the center of electricity, the molecules of the conductor lie in regions which are at a different potential to that of the molecules themselves.

***

Hence there is a tendency of the electrical energy to do work in moving itself and its associated matter from points at high potential to points at low potential.

***

Now, in the case of a cone, the center of electricity (like the center of gravity) is near the thick end, and the more so according as the thin end is thinner (*i. e.*, contains fewer molecules). Hence the thin end lies in regions at a very different potential to itself, and the tendency of the electrical energy to leave the surface and enter those regions is very great. In common language, "discharge" takes place.

***

B. Inductive separation of $+E$ and $-E$, as in the case of a cylinder in the neighborhood of an electrified body. The cylinder is commonly said to have an accumulation of $+E$ at one end $-E$ at the other.

***

Such a cylinder lies in regions of uneven potential; and it takes, as a whole, the average potential. Hence one end of it is in a region of higher potential than itself and electricity tends to approach it ($-E$); the other end is in a region of lower potential and electricity tends to go out of it ($+E$).

***

C. Condensers of electricity. The tendency of electrical energy to go out of an electrified body depends on the difference of potential at the point where the medium changes (as the tendency of water to escape from a pipe depends on the difference of pressure inside and outside the pipe).

Scientific Bull Fight in Mexico's Capital.

MEXICO, August 6, 1883.

Yesterday was a gala day at Huisachal, the occasion being the benefit given to the captain and matador of the company of fighters, and, as rare sport was anticipated by lovers of the ring, I decided to attend.

At 2 P. M. our party of four boarded the street cars at the Zacalo (cars for the ring carry a red flag), and away we went, through the city along the aqueduct, past Chapultepec and Molino del Rey, through plantations of maguey, from which plant natives were extracting pulque, the favorite Mexican drink. Arriving at the Ring, after a ride of an hour, all for 25 cents, 4 miles—admission, $1 for a seat in the shade, 50 cents in the sun. We each happened to have a dollar. Entering the door, we found ourselves in a large amphitheater, with a seating capacity of 5,000 and standing room for as many more. It was estimated that 7,000 people were present, many ladies and children being among the audience. The seats are arranged like those in a circus, with the top tier protected by the roof and divided into private boxes, for the privilege of occupying which an extra $1 is asked per head. A band was playing lively airs, the crowd gaily attired and cheering lustily. The ring is about 200 feet wide, separated from the lower tier of seats by a second ring of a yard wide and guarded by ropes, so that a *toro* (bull) cannot very easily get into the audience.

The judges' stand is situated in the west center of the upper tier. The judges are supposed to have absolute charge of the ring, and issue their commands through a bugler, who has calls for different orders.

At 4:15 the bugle sounded, and in marched the *toreros* (fighters), nine in number, gaudily attired in all the colors; two clowns, dressed like circus clowns, and whose duties are the same; two lassaderos, mounted men who lasso and drag out the horses killed by the bulls, and bulls that refuse to fight; two picadores, also mounted and armed with picas, wooden lances with an iron point. The picadores do the first fighting, and have an exciting time of it.

After the company had made their bow to the judges, the bugle sounded a charge, and the gate leading to the bull-pen swung open. In an instant thereafter a large red bull came tearing into the ring, maddened by a small banderilla being stuck into his side as he enters. The toreros taunt him with flinging their red capas (flags) in his face and draw him toward the picadores, who stand with the horses right side facing the bull, the fore and hind shoulders of the horse protected by leather aprons.

The first and second bulls tossed the picadores about quite lively, but did no killing and were finally killed by a single thrust of the matador's sword.

The matador challenges the bull with his capa, and avoiding the attack by jumping to one side, plunges his sword into the heart of the bull, who generally drops dead, but to make assurance doubly sure a peon advances with a dirk-knife and severs the spinal vertebrae. A three-mule team comes swinging in and the dead brute is yanked out into a pen.

Toro number three came in with blood in his eye, "loaded for bear," determined to make trouble and succeeded admirably.

Making one or two charges at toreros, he sighted a picador and with a roar he charged, tossing horse and rider high into the air. The horses are small and light weight, and often thrown many feet over the head of the bull. In as many minutes the two horses ridden by picadores were killed by the bull, and two more horses brought in to meet the same fate as quickly. One poor horse ran about the ring tramping on his entrails and was literally torn to pieces by the now thoroughly frantic bull.

The bugle sounded for the toreros to fight, and the picadores retire. Two of the bravest of the toreros advance, holding in each hand a pointed banderilla (a tissue-paper feathered and fringed instrument of torture with a barbed iron point about 1 foot long, stuck into the bull's flanks or shoulders while charging) used to madden the bull and drawing blood very freely. After a half dozen of these are streaming over the bull, the bugle sounds for the matador (killer) who gives the *coup de grace.*

No. 4, a fine black bull, came tearing in with a oh-where-is-he look and made directly for a picador, tossed horse and rider almost into the audience, and continuing his explorations treated picador No. 2 as unselfishly. The toreros amused him while fresh horses were introduced, one of which he forthwith sent quivering to his death.

Bugle sounds "charge," and the matador (beneficiary) advanced with a banderilla between his teeth, and by a dexterous movement, succeeded in fastening it in the bull's forehead. The bull turned like a flash and caught the brave fellow by the legs, threw him several feet in the air and received him squarely on his horns in his descent, one horn entering his left side, pitched him twice again, followed him up and rolled him over on the ground, contrary to usual custom as they very seldom follow up a charge. The matador was raised by his companions and walked from the ring, bleeding profusely, and expired a few minutes after, thus making a glorious (?) termination to the day and Felicitos Mejia, one of Mexico's most renowned bull fighters.

What occurred after his death I cannot record, as we had had quite enough for one day, and returned home.

This national sport is carried on regularly, Sunday being the favorite day, and patronized by all classes.

Mr. Henry Bergh would find a splendid field for his labors in this country, yet it would be a dangerous field, as bull and cock fighting "rank highly."

G. W. LA RUE.

Electrical Conduit Construction Company.

This company, of which the articles of incorporation were filed at Albany on last Wednesday, has a capital stock of $1,000,000, divided into 100,000 shares. The incorporators are:

H. W. Pope, Vice-President of the Manhattan District Telegraph Company of New York; A. B. Chandler of the Fuller Electrical Company of New York; H. W. Fairbanks, Superintendent of the Postal Telegraph Company; S. F. Kneeland, of New York; Prof. Elisha Gray and D. N. Hurlbut, of Chicago.

The company was formed for the purpose of extending the underground cable system now used in Chicago by the Postal Telegraph Company. This system is the invention of D N Hurlbut, a telegrapher of Chicago, and one of the incorporators of the company. It provides for the economical placing of telegraph wires under ground, has been tested and found efficient and remarkably cheap, and is recommended by eminent practical telegraphers.

Old Orchard Illuminated.

THE FAVORITE RESORT UNDER THE ELECTRIC LIGHT.

The following report we take from the *Manufacturers' Gazette*, which we have to abbreviate for want of space:

The train which rolled out from the Boston & Maine depot Monday, August 12, had attached a special car kindly furnished by General Superintendent James T. Furber for the accommodation of some forty gentlemen, who had accepted an invitation to witness the initial illumination of that popular Summer resort, Old Orchard Beach, by electric light.

The invitations were issued by Mr. Edward H. Goff, president of the American Electric and Illuminating Company, whose plant has just been established at that point, making it the first beach in the country to be thoroughly illumined by the electric spark. The company consisted of many well-known business men of this and other cities, and representatives of the press, and included, besides Mr. Goff and Superintendent Furber, Mr William A. Hovey, second vice-president of the company; Col. Fred. Mason, president, and H. D. Stanley, general agent of the Bridgeport Brass Company of Bridgeport, Ct.; Alderman George W. Fifield, Lowell; Mr Henry Colony, of the Cheshire Mills, Keene, N. H.; Messrs. Martin V Brady, R. F. Straine and Alderman J. B. Allen of Providence, R. I.; Mr. Charles H Child, of Brown Bros. & Co., dealers in mill supplies, of that city; Mr. M. P. Curran, chairman of the Board of Boston Police Commissioners; Dr. J. G. Graves, of Nashua, N. H.; Messrs. W. E. Hodgkins and C. G. Beals of the firm of Charles A. Smith & Co., merchant tailors, of Boston; Mr. A. F. Upton, general manager of the Jarvis Engineering Company of Boston; Hon. Charles Robinson and Col. J. E. Bickford of the United States Customs Service of Boston; Mr. A. A Knowles, of the Pennsylvania Railroad; Mr. W. W. Davidson, of the Baltimore & Ohio Railroad; Mr. W. C. Tallman, of the Grand Trunk Railway; Mr. G C. Sims, of the celebrated Armington & Sims Engine Company of Providence, R. I., who furnish the power to operate the works; Mr H E. Irvine, treasurer, Mr. Samuel Elder, secretary, Mr. E. J. Welch, electrician, and Mr C. D. Smith, general superintendent of construction of the American Electric and Illuminating Company; Mr. Abel Wheeler, of Lowell; Mr. W. O. Haskell, of the Boston *Evening Star;* Mr. E A Sears, of the Boston *Daily Advertiser;* Mr. J. A Fynes, of the Boston *Herald;* Mr. Henry O'Meara, of the Boston *Journal;* M. L. H. Weeks, of the Boston *Post;* Mr. James S. Manahan, of the Boston *Traveler;* Mr. John H. Crandon, of the *Manufacturers' Gazette;* Col. Albert Clarke, of the Boston *Times;* Mr H. C. Gray, of the Malden *Mirror.*

Old Orchard was reached shortly after 4 P. M., and the party proceeded to the Old Orchard House, where, after a brief rest, barouches were taken to visit the lighting station, which is located near the beach, about half a mile west of the depot. Little more than three weeks ago this station was a plain, square, unfinished wooden building, 40x50 feet, with its sills resting upon the sand. The company bought it, excavated a basement for its boiler and furnaces, built solid brick foundations and piers for the support of its engines and dynamos, and put in the machinery and appliances of the plant, and finished the wood-work outside and inside, making it complete. When the party visited it, the mechanics were still at work, and somebody said: "You won't be able to get this into running order to-night, Mr. Goff." "Yes, sir," replied that gentleman, "everything will be ready to turn on the lights at seven o'clock," and the result showed that he was right. After fully examining the station and its machinery, the party was treated to a ride along the beach, which was most delightful. Along the beach, as far as the eye could reach, were the poles of the beach lights, forty in number, set just above high-water mark. Sixty more lights are placed at various points above the beach, making altogether a system of one hundred lights.

The plant consists of a steel boiler from the Charles River Works of Messrs. Kendall & Roberts, of Cambridgeport, Mass., with Jarvis furnace settings, supplying power for three Lawrence engines of 50 horse-power each (two of which are set and running), manufactured by the Armington & Sims Engine Company of Providence, R. I. These engines drive four dynamos of the Thomson-Houston system. The furnace consumes one and one-half tons of coal nightly to keep the 100 lights burning from seven to twelve o'clock, the hours during which they are in operation. The Old Orchard system illumines the whole place within an ellipse probably more than a mile long and half a mile wide.

At about 7:15, when the shades of night began to settle down, the electric current was turned on and Old Orchard, the pioneer in this respect, was lighted as no watering-place was ever lighted before. There were several set pieces in the pyrotecnic display that took place just after dinner, including many set pieces of beautiful design, and the display closed with the set piece "American System of Electric Lighting," in varied and beautiful colors. The piazza of the hotel was crowded, the stairway and platform leading to the railroad depot was crowded, the lawn in front was crowded and the roads were filled with teams and pedestrians And away beyond was the magnificent beach, its broad and shining sands stretching down to the glorious breakers, all as plain to the sight under the glare of the electric light at a distance of nearly half a mile, as it had been at noonday. The weather was all that the most exacting could have desired to make an excellent display.

Among the guests present were Governor Robie of Maine, and several members of his staff, the Mayors of Portland, Saco and Biddeford with their respective boards of the city governments, City Marshal Andrews, of Portland, and many prominent officials and citizens from that and other cities.

After the fireworks the party took to the carriages once more and visited the lighting station to see the works in practical operation. And what a sight it was! Everything, though started then for the first time, was in as perfect running order as if the plant had been in operation for years. Not a jar or a slip occurred. There was Mr. Sims, the builder of the engines, personally superintending their initial work, examining with the eye of a master every detail of their operation He found no "screw loose," of course, as anyone familiar with his work can readily believe. The wheels of the engines were running at the rate of 300 revolutions per minute and the dynamo machines 875 per minute, but so smoothly did the engines work that there was no noise and scarcely any jar to the floor.

After a full inspection of the practical working of the enterprise another drive over the beach under the light of the 40 lamps was enjoyed, and it was the sensation of a lifetime.

In the morning a hearty breakfast with mine host Pillsbury of the Revere House (the party on account of the crowded condition of the hotels being distributed among different ones for the night), and to the cars again for Boston at 9:30. The same car that brought the party down was boarded, and the ride was a repetition of that of the day before.

Boston was reached at about 2 P. M., but not before a testimonial of thanks to Mr. Goff had been drawn up and signed by every member of the party. Following is a copy:

"We, the undersigned members of the excursion party to Old Orchard Beach, Me., Monday, August 13, to witness the opening and putting into successful operation at that place of the new electric lighting station of the American Electric and Illuminating Company of Boston, desirous of showing our appreciation of the many courtesies extended on that occasion by the genial and hospitable President of the company, Mr. E. H. Goff, hereby tender our individual and collective thanks to that gentleman, and earnestly hope that the great measure of success that has attended him in this vast undertaking may be and abide with him through life. True merit will always come uppermost. We, one and all, vote President Goff the "Prince of good fellows," an efficient officer, and identified with an enterprise that will prove in the future to be a blessing to the whole human family."

Mr. Goff was indefatigable throughout the trip in his efforts to make the party happy, and he was ably assisted by other officers of the company.

The success which has attended the lighting of Old Orchard will doubtless lead to the illumination of other resorts by the American Electric system.

NEW PATENTS—ELECTRICAL—1883.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING AUGUST 21, 1883.

283,590 Electric annunciator; Edward Flirt, Jr., assignor to American Bell Telephone Company, Boston, Mass.

283,482 Electric lamp; Chas. D. Haskins, New York, N. Y., assignor to Western Electric Company, Chicago, Ill.

283,736 Electrical signaling device; William S. Johnson, Washington, D. C.

283,492 Apparatus for protecting telephonic and telegraphic instruments; Frank E. Kinsman, New York, N. Y.

283,498 Armature for dynamo-electric machines; John T. Lister, Cleveland, Ohio.

283,626 Signaling apparatus for telephone exchanges; Thos. D. Lockwood, Malden, Mass.

283,498 Dynamo-electric machine; Abram M. Loryea and C H. Palmer, New York, N Y.

283,716 Telegraph transmitter; Henry Lyon, New York, N. Y., assignor to American Postal Telegraph Company.

283,629 Electric lamp; Hiram S. Maxim, Brooklyn, assignor to United States Electric Lighting Company, New York, N Y.

283,662 Electric arc lamp; Charles Richter, Camden, N. J.

283,665 Automatic telegraph; James W. Rogers, New York.

283,433 Electric conductor; Henry D. Stanley and G. Doolittle, Bridgeport. Conn.

283,437 Electric lamp; Elihu Thomson, assignor to Thomson-Houston Electric Company, New Britain, Conn.

283,544 Vacuum apparatus; Edward Weston, Newark, N. J., assignor to United States Electric Lighting Company, New York, N. Y.

283,545 Vacuum pump; Edward Weston, Newark, N. J., assignor to United States Electric Lighting Company, New York, N. Y.

283,546 Electro-magnetic motor; Edward Weston, Newark, N. J., assignor to United States Electric Lighting Company, New York, N. Y.

283,547 Electrical meter; Edward Weston, Newark, N. J., assignor to United States Electric Lighting Company, New York, N. Y.

283,548 Dynamo-electric machine; Edward Weston, Newark, N. J., assignor to United States Electric Lighting Company, New York, N. Y.

283,549 Apparatus for producing vacuums; Edward Weston, Newark, N. J., assignor to United States Electric Light Company, New York, N. Y.

Telephone Stock Quotations.

American Bell Telephone Company	256½
Bay State Telephone Company	123
Central New York Telephone and Telegraph Company	106
Boston and Northern Telephone Company	135
Empire State Telephone and Telegraph Company	203
Granite State Telephone Company	95
Hudson River Telephone and Telegraph Company	112
Long Island and New Jersey Telephone Company	102
Mexican Telephone Company	2½
National Bell Telephone Company of Maine	90
New York and Pennsylvania Telephone Company	100
Northwestern Telephone Company	100
Southwestern Telephone Company	68
Suburban Telephone Company	139
Southern Bell Telephone and Telegraph Company	125
Tropical Telephone Company	3
Central Union Telephone Company	105
Iowa Union " "	100
Missouri and Kansas Telephone Co.	98
United Telephone Company (Kansas and Missouri)	89
Bell Telephone Company, of Missouri	165
Wisconsin Telephone Company	130
Cumberland Telephone Company	105
Great Southern Telephone Company	102
Michigan Telephone Company	100
Chicago Telephone Company	290

An electric machine, designed to register and record the votes of parliamentary bodies, is to be placed in one of the rooms of the Capitol at Washington as an experiment, which, if it works satisfactorily, will likely be introduced into the House of Representatives. By this system a yea and nay call of the House of Representatives can be made, it is claimed, in less than a minute. The machine prints the name of each member and indicates on what side he votes. It also indicates the absentees and those who are paired.

Manufacturing News.

Iron and steel works are to be erected at once at Gunnison, Col., a company having been organized for that purpose with a capital of $5,000,000.

The Redstone Coal Company, it is said, will break ground within the next thirty days for a new rolling mill on the Redstone branch of the Pennsylvania Railroad, either at Smock's Station or at Hill's Bridge, one mile above.

The new steam yacht Atalanta, owned by Jay Gould, is lighted with the Edison electric lights, and one dynamo is used, furnishing 150 lamps. The power is derived from a 6½'x8" Armington & Sims Company engine. It is only a question of time when all ocean steamers, ironclads and men-of-war will use the incandescent light, thus doing away with the heat and smell of oil.

The Armington & Sims Engine Company, Providence, have shipped the following engines for the Edison Company: One for the elevator of the New York, Lake Erie and Western Railroad Company at Buffalo; one for Edison Electric Light Company, Sunbury, Pa.; one for Miller's Industrial School, Baterville, Pa.; two for Shamokin Edison Electric Light Co., Shamokin, Pa. They are also making engines for the Edison station at Brockton and Lawrence, Mass.

Terms to American Rapid Operators.

WASHINGTON, August 24.—The American Rapid employes here have been notified that all the advantages accorded them during the the strike, when the company conceded to their demands, have been revoked. They will hereafter receive the old rate of wages paid before the strike, and will be required to work the same number of hours.

A Legislature in Favor of a Government Postal Telegraph.

CONCORD, N. H., August 24.—A joint resolution was passed by the Legislature to-day in favor of a Government postal telegraph system.

Volume II. of the ELECTRICAL REVIEW closes with this number. The Index, which is now being prepared, will be completed and enclosed to all subscribers with the next edition, September 6th.

The Calcutta Exhibition, it is likely, will be very successful. There are already 400 exhibitors from Great Britain. The Australian colonies have taken up the exhibition with much spirit. The exhibition buildings will be ready probably in October.

Scientific Association.

At the meeting of the Scientific Association at Minneapolis, Minn., last week, the following officers were chosen for the ensuing year:

President—J. P. Lesley, Philadelphia, Pa.
General Secretary—Dr. Alfred Springer, Cincinnati, O.
Assistant General Secretary—E. S. Holden, Madison, Wis.
Treasurer—Wm. Lilly, Mauch Chunk, Pa.
Section A.—President, H. T. Eddy, Cincinnati, O.; Secretary, G. W. Hough, Chicago, Ill.
Section B.—President, John Trowbridge, Cambridge, Mass.; Vice-President, D. C. Hodges, Salem, Mass.
Section C.—President, John W. Langley, Ann Arbor, Mich.; Vice-President, Robert B. Warden, North Bend, O.
Section D.—President, R. H. Thurston, Hoboken, N. J.; Secretary, J. B. Webb, Ithaca, N. Y.
Section E.—President, N. H. Winchell, Minneapolis; Secretary, E. A. Smith, Tuscaloosa, Ala.
Section F.—President, E. D. Cope, Philadelphia, Pa.; Secretary, C. E. Bessey, Ames, Iowa.
Section G.—President, D. J. Wormley, Philadelphia, Pa.; Secretary, H. Hitchcock, New York City.
Section H. President, E. S. Morse, Salem, Mass.; Secretary, W. H. Holmes, Washington, D. C.
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WANTED—By September the 1st, a situation by a young man of large practical experience in an electric light company, to put up or run dynamo machines; can adjust and regulate lamps, run line wires, etc. Address, "Experience," P. O. Box 3329, New York.

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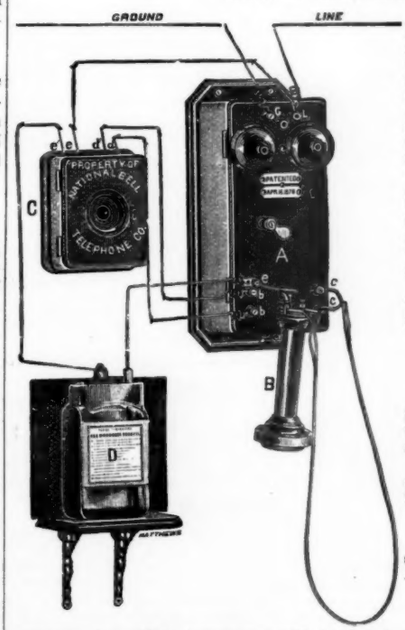

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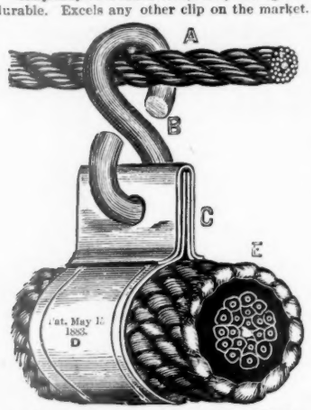

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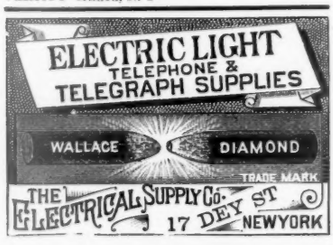

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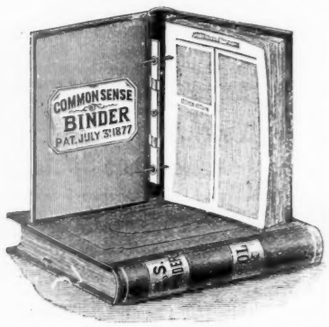

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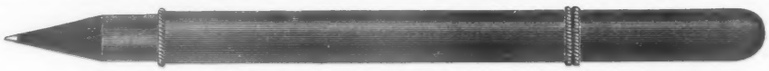

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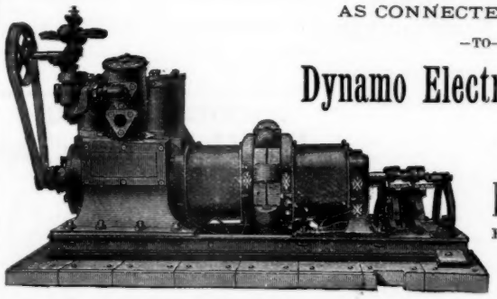

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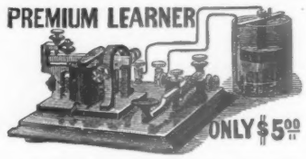

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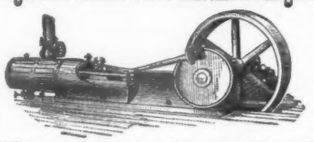
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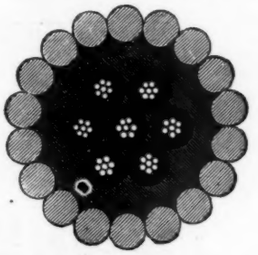

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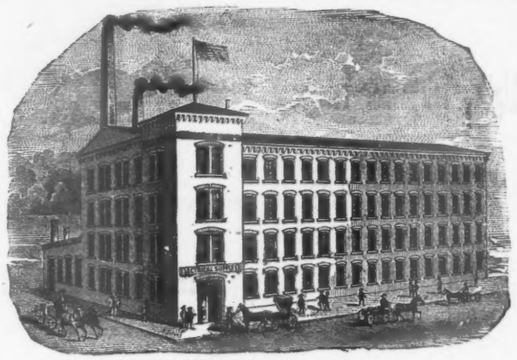

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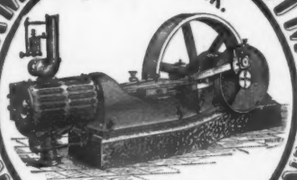

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